



IMPERIAL INSTITUTE
OF
AGRICULTURAL RESEARCH, PUSA.

LIST OF MEMBERS,

Revised to June 30th, 1915.

It is particularly requested that Members will inform the Secretaries as soon as possible of any change of address.

HONORARY MEMBERS.

Anderson, E., 11, Marlton Crescent, St. Kilda, Melbourne, Australia.
Grant, G. F., Beaumont Manor, Wormley, Broxbourne, Herts.
Huckett, T., New North Road, Islington, N.
Massey, Herbert, F.E.S., Ivy Lea, Burnage, Didsbury.
Stevenson, F., 155, Trinity Road, Upper Tooting, S.W. (Ent.)
Walsingham, Right Hon. Lord, M.A., LL.D., F.R.S., F.L.S., F.Z.S., F.E.S., Merton Hall, Thetford, Norfolk.

MEMBERS.

Acheson, Miss H. Mc N., 119, Thurlow Park Road, West Dulwich, S.E.
Adkin, R., F.E.S., 4, Lingard's Road, Lewisham, S.E.
Archer, T. H., 52, Elsenham Street, Southfields. (Lep.)
Armstrong-Jones, Robert, M.D., F.S.A., Claybury, Woodford, Essex.
Ashmead, Miss Mabel, 180, Bishopsgate Street, E.C.
Austen, W. H. A., 102, Knightsbridge, S.W. (Ent.)
Austin, S., 43, Darenth Road, Stamford Hill, N. (Ool., Orn., Arch.)
Bacot, A., F.E.S., 26, Westmorland Street, Freetown, Sierra Leone, West Africa.
Baker, W. E. Watson, 313, High Holborn, W.C.
Barnes, H. J., Mount Echo, Chingford, N.E.
Barnes, R. C., Loën, Grange Avenue, Woodford Green.
Bartlett, H. A., 17, Eglington Road, Chingford, N.E.
*Battley, Mrs., 6, Craven Avenue, West Ealing, W.
Beattie, W., 9, Edith Villas, West Kensington, W. (Ent.)
Benton, R. G., "Cotswold," Queen's Avenue, Muswell Hill, N. (Ent.)
Bird, E. J., 107, Whipps Cross Road, Leytonstone, N.E.
Bishop, E. B., Lindfield, Marshall Road, Godalming. (Bot. Lep., Arch.)
Blum, Victor, 23, Valentine's Road, Ilford. (Ent.)
Bowles, E. A., M.A., F.I.S., F.E.S., Myddleton House, Waltham Cross, Herts.
Bradley, S. W., Forest Dene, Kimberley Road, Chingford, N.E.
Braithwaite, J. O., 18, Warren Road, Chingford, N.E. (Micr., Bot., Ent.)
Braithwaite, Miss D. M., 18, Warren Road, Chingford, N.E. (Bot., Micr.)
Braithwaite, Miss N. A., 18, Warren Road, Chingford, N.E.
Braithwaite, J. V. C., 18, Warren Road, Chingford, N.E.
Bridge, S., 28, Larkham Rise, Clapham. (Micr.)
Briggs, C. A., F.E.S., Rock House, Lynnmouth, R.S.O., South Devon.
Brooke, Chas., 160, Wardour Street, W. (Ent.)
Brooke, Miss E. K., 12, Warren Road, Chingford, N.E.
Brooke, Mrs. T. R., 12, Warren Road, Chingford, N.E.
Brooke, C. J. B., 12, Warren Road, Chingford, N.E.
Brooke, Thos. R., F.R.M.S., 12, Warren Road, Chingford, N.E. (Micr.)
Brooke, Thos. W., 12, Warren Road, Chingford, N.E. (Lep.)
Brown, J. Wontner, 61, Onslow Gardens, Highgate, N.
Burge, Percy F., 154, Lordship Road, Stoke Newington, N.

- Burkhill, Harold J., 103, Gresham House, Old Broad Street, E.C. (Plant galls).
 Burrows, Rev. C. R. N., The Vicarage, Mucking, Stanhope-le-Hope, Essex. (Ent.)
 Bush, Miss A., "Daisycroft," England's Lane, Loughton, Essex.
 Capleton, A., 67, Queens Road, Leytonstone, N.E.
 Capleton, J. H., 14, Harold Road, Leytonstone, N.E.
 Capper, Cl^{as}is, F.E.S., 6, Leinster Avenue, East Sheen.
 Chapman, E., 141, York Road, Woking. (Arch.)
 Chapman, Dr. T. A., F.Z.S., F.E.S., "Betula," Reigate, Surrey.
 Clarke, J. W., "Hazeldene," The Ridgeway, Chingford, N.E.
 Cockayne, E. A., M.A., D.M., M.R.C.P., F.E.S., 16, Cambridge Square, W.
 Collenette, C. L., c/o Messrs. F. W. Barker and Co., Penang, Straits Settlements. (Orn., Dipt.)
 Cook, E. Bernard, "The Firs," Woodford Green. (Bot.)
 Cooper, B., 103, Bethune Road, Stoke Newington, N. (Lep.)
 Cox, Oswald, "Croftdown," Shepherds Hill, Highgate, N.
 Crabtree, B. H., F.E.S., Cringle Lodge, Levenshulme, Manchester.
 Cross, F. B., Park Villa, 65, Bruce Grove, Tottenham, N. (Lep.)
 Cyriax, R. C., 23, Aberdare Gardens, West Hampstead, N.W. (Arch., Aryan question, Indo-European languages.)
 Dadd, E. M., F.E.S., Puppelstr., Zehlendorf bei Berlin.
 Dell, F. G., "The Hut," Russell Road, Buckhurst Hill, Essex.
 Dewshurst, Rev. H., M.A., St. Andrew's Vicarage, Leytonstone, N.E.
 Dewshurst, Mrs., St. Andrew's Vicarage, Leytonstone, N.E.
 Digby, D. E., "Summerfield," Snakes Lane, Woodford Green. (Bot.)
 Digby, Howard, "Summerfield," Snakes Lane, Woodford Green. (Geol.)
 Dodd, W. R., Burton Grange, Cheshunt, Middlesex. (Ent.)
 Douglas, J., "Thorncote," Chellaston, near Derby. (Lep.)
 Edelsten, H. M., F.E.S., "The Elms," Forty Hill, Enfield, N.
 Evans, R. G., The Meadows, Whitchurch Lane, Edgware.
 Eynon, Mrs. E. R., 4, Stag Lane, Buckhurst Hill, Essex.
 Eynon, Lewis, B.Sc., F.I.C., 4, Stag Lane, Buckhurst Hill, Essex.
 Fleming, John, 180, Bishopsgate Street, E.C.
 Gardner, J. E., 204, Evering Road, Upper Clapton, N.E. (Lep., Bot.)
 Gaze, W. E., 10, The Avenue, Highams Park, Chingford, N.E.
 Gerrard, V., "Stratheden," Broomhill Road, Woodford Green. (Ent.)
 *Gibbs, A. E., Kitchener's Mead, St. Alban's, Herts. (Ent.)
 Glegg, W. E., Brewery House, Stamford Hill Brewery, N. (Orn.)
 Goodwin, J. L., 31, Copthall Avenue, E.C. (Orn.)
 Gould, F. G., "Elmshurst," Church Hill, Loughton. (Bot.)
 Gravatt, Wm., "Dunedin," The Ridgeway, Chingford, N.E.
 Greengrass, H. C., "Elmfield," 51, The Ridgeway, Chingford, N.E.
 Greengrass, Miss Madeleine, "Elmfield," 51, The Ridgeway, Chingford, N.E.
 Greenwood, M., jun., L.R.C.P., M.R.C.S., "Hillcrest," Church Hill, Loughton, Essex. (Arch., Biol.)
 Grosvenor, Thomas H. L., "Waldeans," Gloucester Road, Redhill, Surrey. (Ent.)
 Gwatkin-Williams, Captain R. S., R.N., 70, Lissenden Mansions, Highgate Road, N.
 Hall, L. B., F.L.S., 16, Meadowcroft Road, Palmer's Green, N. (Bot.)
 Hanbury, Frederick J., F.L.S., F.E.S., Brookhurst, East Grinstead. (Bot. Ent.)
 Hanbury, F. Capel, "The Gables," Forty Hill, Enfield. (Ent.)
 Hanson, P. J., "Burcroft," Village Road, Bush Hill Park. (Orn. Lep.)
 Hanson, Mrs., "Burcroft," Village Road, Bush Hill Park.
 Harris, Edward, F.E.S., St. Conan's, Chingford, N.E.
 Harvey, F. B., 20, Bow Lane, North Finchley, N.
 Hayward, H. C., The Croft, Repton, Derbyshire (Ent.)
 Heath, G. H., M.A., 277, Brockley Road, S.E. (Ent.)
 Hodge, A. E., 14, Astonville Street, Southfields. (Lep.)
 Holman, Miss Hilda K., "Stanmore," 16, Wilton Road, Muswell Hill, N.
 Howard, D. Lloyd, J.P., F.I.C., F.C.S., Little Friday Hill, Chingford.
 Hubbard, A. G., B.Sc., 110, Station Road, Chingford. (Orn.)
 Jackson, F. W. J., Woodcote End House, Epsom. (Ent.)

- James, Russell, E., "Brockenhurst," Bloomfield Road, Highgate, N.
 *Kaye, W. J., F.E.S., "Caracas," Ditton Hill, Surbiton, Surrey.
 Kind, H. A., 63, Empress Avenue, Woodford Green. (Lep.)
 King, W. E., 54, Barnsbury Grove, Barnsbury, N.
 Latham, E. B., "Hillside," Epping New Road, Buckhurst Hill. (Orn.)
 Latham, James, "Hurstwood," Woodford Green. (Bot.)
 Latham, Russell, "Hillside," Epping New Road, Buckhurst Hill. (Api.)
 Legg, D. J., "Tintern," Mornington Road, Woodford Green. (Geol.)
 Legg, T. E., "Tintern," Mornington Road, Woodford Green. (Orn., Arch.)
 Le Marechal, W. H., 38, Warren Road, Chingford, N.E.
 Lewis, S. G., "The Croft," Warren Road, Chingford. (Orn.)
 Limburg, H. von, "Sunnyside," Montalt Road, Woodford Green.
 Loney, Herbert, 354, Goswell Road, E.C. (Ent.)
 MacIntosh, Miss I. S., "Hawthornden," Mornington Road, Woodford Green. (Bot.)
 MacIntosh, Miss J. D., "Hawthornden," Mornington Road, Woodford Green.
 MacIntosh, Donald, "Hawthornden," Mornington Road, Woodford Green.
 Maitland, Donald F., May Cottage, Harold Wood, Essex. (Lep.)
 Mathieson, Miss M. L., 7, Crescent Road, Chingford, N.E.
 Mera, A. L., Outwood, High Road, Loughton, Essex. (Lep.)
 Mera, A. W., Outwood, High Road, Loughton, Essex. (Lep.)
 Moore, J. E., 31, Copthall Avenue, E.C.
 Murray, C., Uphall Farm, Ilford, Essex. (Lep.)
 Murray, L. C., 9, Charlbury Gardens, Goodmayes, Essex. (Ent., Geol.)
 Mutch, J. P., 405, Hornsey Road, N. (Ent.)
 Newbery, E. A., 13, Oppidans Road, Primrose Hill, N.W. (Ent.)
 Newman, L. W., F.E.S., 41, Salisbury Road, Bexley, Kent.
 *Nicholson, Miss B., 202, Evering Road, Upper Clapton, N.E.
 Nicholson, C., 35, The Avenue, Hale End, Chingford, N.E. (Lep. Bot. Micr.)
 Nicholson, C. S., F.L.S., 42, Avenue Road, Highgate, N. (Bot.)
 Nicholson, Mrs., 42, Avenue Road, Highgate, N. (Bot.)
 Nicholson, Miss Muriel, 42, Avenue Road, Highgate, N.
 Nicholson, Miss Margaret, 42, Avenue Road, Highgate, N.
 Orr, H. Scott, 4, Monkham's Cottages, Woodford Green.
 Paton, Roger C., M.A., Streatham College, Streatham, S.W. (Ent.)
 Payne, H. T., 70, Castlewood Road, Stamford Hill, N. (Lep.)
 Pearce, F. C., "Diconwyn," Woodford Green. (Orn.)
 Pearce, J. P., "Diconwyn," Woodford Green. (Orn.)
 Pearson, G., 10, Brushfield Street, Bishopsgate, E.C.
 Pennington, F., Reform Club, S.W.
 Pibel, G. A., "The Roses," Woodford Green. (Ent.)
 Pickett, C. P., F.E.S., 28, Colworth Road, Leytonstone, N.E. (Lep.)
 Prout, L. B., F.E.S., 84, Albert Road, Dalston, N.E. (Lep.)
 Raven, Rev. C. E., 4, Park Terrace, Cambridge. (Lep. and Orn.)
 Reynolds, F., "Forest Lodge," Oak Hill, Woodford Green. (Zool.)
 Riches, J., 52, Calverley Grove, Hornsey Rise, N. (Lep.)
 Robbins, R. W., "Tonah," Hale End, Chingford, N.E. (Bot. Lep. Orn.)
 Robbins, Mrs., "Tonah," Hale End, Chingford, N.E. (Bot.)
 Robinson, S., Holmleigh, Whitchurch Lane, Edgware.
 Rose, A. J., F.E.S., 1, Harewood Road, South Croydon.
 Ross, J., 18, Queens Grove Road, Chingford, N.E.
 Routledge, G. B., F.E.S., Tarn Lodge, Headsnook, Carlisle.
 Russell, Rev. A. F., M.A., The Chantry, Chingford, N.E.
 Ryde, W. H., 81, Poppleton Road, Leytonstone, N.E.
 Sabine, L. A. E., 83, Lucien Road, Tooting Common, S.W. (Ent.)
 Samuelson, Miss Dorothy, Fairview, 39, The Ridgeway, Chingford, N.E.
 Samuelson, Edward, Fairview, 39, The Ridgeway, Chingford, N.E.
 Sarvis, John, May Cot, Maybury Hill, Woking, Surrey.
 Satchwell, Miss Kate, Buckhurst Hill College, Buckhurst Hill, Essex.
 Sauze, H. A., 35, Collingtree Road, Sydenham, S.E.
 Scollick, A. J., F.E.S., "Elmwood," New Malden, Surrey. (Lep.)

- Shaw, V. Eric, F.E.S., "Betula," Park View Road, New Eltham, Kent. (Hym. Lep. Mic.)
- Sich, Alfred, F.E.S., Coney House, Chiswick, W.
- Simes, J. A., F.E.S., "Mon Repos," Monkham Lane, Woodford Green. (Lep.)
- Simpson, W., M.B., B.S., "Polmnennor," Snakes Lane, Woodford Green. (Arch. Bot.)
- Slater, W., 38, Peterborough Road, Leyton, N.E.
- Smith, A. C., "Horton," Mornington Road, Woodford Green. (Ent.)
- Smith, C. B., 61, Onslow Gardens, Highgate, N. (Lep.)
- Smith, Mrs., 61, Onslow Gardens, Highgate, N. (Geol.)
- Southgate, F. H., 109, Kensington Avenue, Manor Park, E. (Ent.)
- Spittle, D. G., 91, Wellington Road, Snaresbrook.
- Spragg, E. R., F.G.S., 1, Champion Road, Upminster. (Bot.)
- Stemp, R., Hinton Villa, Heathcote Grove, Chingford, N.E.
- Stevenson, H. E., F.C.S., "Entwistle," 43, Empress Avenue, Woodford Green. (Chem.)
- Stuart, Vernon, West Hill, Putney, S.W. (Lep.)
- Tautz, P. H., F.E.S., Cranleigh, Pinner, Middlesex.
- Thomas, G. O., "Wilfrid Lawson Hotel," Woodford Green.
- Todd, R. G., F.E.S., "The Limes," Hadley Green, N.
- Tremayne, L. J., Whitehall House, 29 and 30, Charing Cross, S.W. (Bot. Lep. Arch.)
- Tremayne, Mrs. L. J., Whitehall House, 29 and 30, Charing Cross, S.W. (Orn. Arch.)
- Van Lessen, R., B.Sc., 69, Downs Road, Clapton, N.E.
- Warren, S. Hazzledine, F.G.S., F.Z.S., "Sherwood," Loughton. (Prehist. Anthropology.)
- Watt, J. Mc B., Monkham Farm, Woodford Green. (Farming and Orn.)
- Watson, R. Marshman, 32, St. Andrew's Road, Stoke Newington, N.E.
- Weighell, F., 6, Paddenswick Road, Hammersmith, W.
- Wilde, Mrs. C. L., Lindfield, Marshall Road, Godalming. (Arch. Bot.)
- Williams, B. S., 77, Durham Road, East Finchley, N. (Ent.)
- Williams, C. H., 36, Dartmouth Street, Westminster, S.W. (Lep.)
- Williams, E., 33, Ashted Road, Upper Clapton.
- Williams, H. B., LL.B., 82, Filey Avenue, Stoke Newington, N.
- Willsdon, A. J., 46, Dover Road, South Wanstead, Essex. (Lep.)
- Wood, H. Worsley, 31, Agate Road, Hammersmith, W.
- Wright, J. A., "Mebury," Grange Road, Bushey, Herts.
- Wrigley, Arthur, 29, Calthorpe Street, Grays Inn Road, E.C. (geol. and prehistoric antiquities.)

* Life Members.

BRANCH ASSOCIATES.

- Arnold, Mrs. C. F., "Lynwood," Victoria Road, Chingford, N.E.
- Bacot, Miss A. H., York Cottage, Loughton, Essex.
- Barratt, A. K., "Idmiston," Monkham Avenue, Woodford Green.
- Betts, R. A. Percy, "Oakover," Woodford Green. (Api.)
- Box, Harold E., 2, Sandringham Terrace, Essex Road, Leyton. (Ent.)
- Connell, Miss E., 5, Connaught Avenue, Chingford, N.E.
- Donnison, Cyril P., "Westcroft," Endlebury Road, Chingford.
- Earl, Miss P., Amberley, Woodside Road, Woodford Green.
- Gill, Mrs., "Durlstone," Higham Road, Woodford Green.
- Hales, A. G., Glenside, Mornington Road, Woodford Green.
- Hornblower, A. B., 32, Forest Drive East, Leytonstone, N.E.
- Hubbard, Mrs., 110, Station Road, Chingford, N.E.
- Hurdle, W., 2, Redland Villas, Carnarvon Road, South Woodford.
- Jones, Miss, 3, Connaught Avenue, Chingford, N.E.
- Kilby, G. S., 54, Lombard Street, E.C.
- Lees, C. H., D.Sc., F.R.S., "Greenacres," Woodside Road, Woodford Green.
- Lewis, T. G., 61, Empress Avenue, Woodford Green.
- MacIntosh, Mrs., "Hawthornden," Mornington Road, Woodford Green.

- Parsons, Miss L., 36, Forest Drive East, Leytonstone.
 Rahm, A. W., "Treknow," Monkams Lane, Woodford Green.
 Rolph, Frank, Harts Stable, Woodford Green. (Micr.)
 Roper, F. W., "Stafford Lodge," Chelmsford Road, South Woodford. (Orn.)
 Roper, H. W., "Stafford Lodge," Chelmsford Road, South Woodford.
 Sheppard, J. H., "Simla Cottage," Snakes Lake, Woodford Green.
 Stevenson, Mrs. H. E., "Entwistle," 43, Empress Avenue, Woodford Green.
 Stratton, Miss Isabel, 37, Buxton Road, Chingford, N.E.
 Thomas, G. W., 86, James Lane, Leyton. (Orn. and Fungi.)
 Watson, J. N., "Lauriston," Mayfield Avenue, Woodford Green.
 Wheeler, Mrs., "St. Conan's," Station Road, Chingford, N.E.
 Whittingham, Mrs. E., "Elleray," High Road, Woodford Green.
 Wilson, A. J., "Parkdale," Churchfields, South Woodford. (Api.)

COUNTRY ASSOCIATES.

- Allen, William, "Southview," Spa Road, Radipole, Weymouth. (Bot.)
 Bental, E. E., "The Towers," Heybridge, Essex. (European Rhopalocera.)
 Beckham, Spencer H., Underdown, Ledbury. (British Phanerogams and Ferns.)
 Blake, Wm., Acacia Villa, Ross, Herefordshire. (Orn. & Conch.)
 Bostock, E. D., Oulton Cross, Stone, Staffordshire.
 Butler, W. E., F.E.S., Hayling House, Oxford Road, Reading. (Lep.)
 Cassall, Dr. R. T., F.E.S., The Surgery, Abertillery.
 Cooke, Rev. P. H., M.A., Ickleton, Great Chesterford, Essex. (Bot.)
 Culpin, M., M.B., F.R.C.S., (Lieut. R.A.M.C.), Saltersgate, Church Hill, Loughton.
 Elford, Rodney R., Glencoe House, 139, Rosary Road, Norwich. (Ent.)
 Fison, Eliot Robert, "Sorrento," Brighton Road, Purley.
 Grubb, Walter C., Barberton, Traansval.
 Hancock, G. D., Mount View, Uffculme, Devon.
 Hopkins, Prof. F. G., M.A., M.D., F.R.C.P., F.R.S., 71, Grange Road, Cambridge.
 (Biochemistry.)
 Longley, W., "Avesbrook," Brook Road, South Benfleet, Essex.
 Martin, Miss F. E., 3, Linthorpe Road, Stamford Hill, N. (Bot.)
 Miller, Miss E., "The Croft," Rainsford Road, Chelmsford. (Lep.)
 Moore, J. W., Middleton Dean, Middleton Hall Road, King's Norton, near
 Birmingham.
 Porritt, G. T., Elm Lea, Dalton, Huddersfield. (Lep., Nem., Orth.)
 Portway, J. B., jun., 91, The Avenue, West Ealing.
 Studd, E. F., M.A., B.C.L., F.E.S., Oxtou, Exeter.
 Ward, J. Davis, "Limehurst," Grange-over-Sands, Lancs.
 Whittingham, Rev. W. G., Knighton Vicarage, Leicester. (Bot., Lep.)
 Wood, P. Worsley, M.A., Emmanuel College, Cambridge. (Field Botany).

NOTE.—The following abbreviations are used in the above lists:—Api., Apiculture; Arch., Archaeology; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Geol., Geology; Hym., Hymenoptera; Lep., Lepidoptera; Micr., Microscopy; Nem., Nemoptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Zoo., Zoology.

EXTRACTS FROM MINUTES.

January 16th, 1914.—EXHIBITS.—Mr. L. B. Prout, *Melanthia bicolorata* var. *plumbata* with an extremely dark suffusion near the margin of the forewings, also *Eupithecia subfulvata* and its ab. *cognata* and intermediates, all from Forres and district. Mr. L. W. Newman, series of *Zygaena minos* from Oban, N.B., and also from Co. Clare, Ireland, to show the variation in the species from Ireland and Scotland, the Scotch specimens being darker than the Irish. Dr. E. A. Cockayne, a series of *Boarmia consortaria* bred from a normal ♀ taken at Oxshott in May, 1912, the progeny being 50% melanic and 50% typical. Also three melanic specimens from a Kentish locality. Mr. W. E. King, series of *Tephrosia crepuscularia* and *Lithosia deplana* from Oxshott, and *T. biundularia* from Epping Forest, including some fine ab. *delamerensis*. Mr. V. Shaw, *Spilosoma mendica* bred from Finchley ova, 1913, including two ♀s having a rusty coloration to all wings.

Mr. C. S. Nicholson, caulescent form of *Carduus acaulis*, L., and forms of *Carduus arvensis* showing the suppression of the spines on the leaves, vars. *setosus* and *mite*, Koch.

COMMUNICATIONS.—Mr. W. E. Glegg reported having seen on December 30th about thirty pochard ♂ and ♀, ♂s in partial eclipse, and two great crested grebe in winter plumage, on Stoke Newington reservoirs.

Miss A. Bush, Miss K. Satchwell, and Mr. A. Wrigley were elected members.

Messrs. A. W. Mera and A. Bacot, the retiring Presidents, gave reminiscences of the old societies, the City of London Entomological and Natural History Societies and the North London Natural History Society. A vote of thanks to Messrs. Mera and Bacot was carried with acclamation.

January 20th, 1914.—EXHIBITS.—Mr. L. B. Prout, *Cidaria truncata* and *C. immanata* taken at Stonehaven, N.B., 1913. He remarked that in South England *C. truncata* is double brooded, appearing at the end of May and again at the end of August, whereas in Scotland it occurs once only—in July—at the same time as *C. immanata*. Scotch *immanata* are more like *truncata* than English ones, and Scotch *truncata* do not vary very much.

Mr. J. O. Braithwaite the skin of a little grebe, *Podiceps fluviatilis*, obtained at Chingford reservoir.

Mr. A. Bacot read a paper on "Insects and Disease," and illustrated his points with numerous tables, drawings and microphotographs thrown on the screen. Mr. Bacot replied to several questions and stated that he had not found any microbes that would attack blood-sucking parasites. A hearty vote of thanks was accorded Mr. Bacot.

February 3rd, 1914.—THE ANNUAL EXHIBITION.—EXHIBITS.—Mr. J. Riches, on behalf of Mr. J. P. Mutch, a series of *Abraaxas grossulariata* all bred from North London wild larvæ, and including fine pale and dark forms and one ab. *nigrosparsata*. Mr. C. H. Williams, a cabinet drawer of *A. grossulariata*, including several ab. *deleta*, Ckll. (*lacticolor*, Rnr.), ab. *variegata*, and others. Mr. C. P. Pickett, series of *Angerona prunaria*, the result of sixteen years interbreeding, including ab. *pickettaria*, and a series showing results of breeding under coloured muslins. Also a series of *Agriades coridon*, the result of two years collecting in Hertfordshire, including a long series of ab. *semisyngrapha* and fine underside forms, obsolete and striate; also several ab. *inaequalis* and ab. *roystonensis*. Mr. A. W. Mera, *Agriades coridon* and ab. *semisyngrapha* and other vars.; also *Lycaena argiolus* from larvæ fed on Portugal laurel, producing a larger form than usual. Mr. H. B. Williams, his series of varieties of *Limnacia phlaeas*, including abs. *alba*, *intermedia*, *remota*, *addenda*, *radiata*, *suffusa*, *eleus*, etc., and a series of *Callimorpha dominula* bred from Deal larvæ, and including many fine forms. Also *C. hera* and its yellow variety, and two fine forms of *Nemeophila russula* ♂, one with no black markings on hindwings, and one with dark suffusion over the greater part of hindwings. Dr. E. A. Cockayne, *Cidaria populata*, type, melanic, and intermediate, from East Aberdeenshire, and *C. testata*, pale orange tinted and Norfolk forms, and pale and intermediate males and females, melanic males, and one melanic female. Mr. L. W. Newman, series of *Smerinthus ocellatus* showing considerable variation in colour. *Amorpha populi*, varying from cream to rich pink, and dark vars., *Smerinthus* hyb. *hybridus* (*ocellatus* ♂. *populi* ♀), parts of several broods, showing considerable variation in ground colour and in the spots on hindwings. Two ♀s which occur rarely (about 1%) in this hybrid and a gynandromorph (?), the antennæ intermediate between those of the two sexes. Mr. Bernard Cooper, *Nyssia* hyb. *denkani* and *Lyca* hyb. *harrisoni*. Mr. L. B. Prout, the same two hybrids, and also the reciprocal hybrids of *Tephrosia crepuscularia* and *T. bidentata*, and extreme forms of these two species. The melanic form of *Venusia cambrica*. Mr. R. C. Paton, *Triphaena fimbria*, including some fine dark forms with blackish suffusion on hindwings. Mr. F. W. Jackson, *Agriades coridon*, from Herts, including striate undersides of the ♂, a fine obsolete underside ♀, and a ♂ and ♀ with wings of different sizes. Mr. W. E. King, varieties of *Noctua festiva*, *Apamea didyma*, *Anchocelis pistacina*, and *A. lamosa*, from North London. Mr. V. E. Shaw, a long series of *Aporophila australis*, from Sandown, I. of W., 1913, also a ♂ var. *orientalis*, H.-S., September 13th, 1913, *ibid*. The latter is a very rare form and only three or four specimens have been recorded. Dr. T. A. Chapman, specimens illustrating the convergence of the forms of certain *Erebias* at high levels:—Of *E. ceto*, *E. melampus*, and *E. pharte*, at Le Lauteret; of *E. pharte* and *E. neanto* at Guarda (Lower Engadine); and of *E. pharte* and *E. eriphyle* in Carinthia.

Whether mimicry or not, the group at each place has a facies that differs from a similar group at other localities, and each species differs from its supposed normal form. *Erebia pharte* is a member of each of

the groups shown. See also *Ent. Rec.*, vol. 26, p. 3, and *Proc. Ent. Soc. Lond.*, December 1913.

Mr. H. Worsley Wood, a long series of the allied species *Xanthia* (*Mellinia*) *ocellaris* and *X. (M.) gilvago*, showing the distinctions between these two species.

Mr. J. Ross, specimens of *Badhamia panicea*, *Colloderma oculatum*, and *Margarita metallica* (mycetozoa) under the microscope. *C. oculatum* was first recorded in Britain in 1911; the specimens shown were from Epping Forest.

Mr. A. G. Hubbard, a set of photographs of tufted duck, white-throats, and of a curious nesting place of a robin. The photos of the tufted ducks' nest furnish the first record for the North London district.

Commander R. S. Gwatkin-Williams, R.N., was elected a member.

February 17th, 1914.—EXHIBITS.—Mr. V. E. Shaw, cocoons, pupæ and empty pupa-cases in situ of *Sesia myopæformis*, also an empty pupa-case of *S. tipuliformis* in situ on a currant twig. Dr. E. A. Cockayne, a fine series of *S. andreniformis* and its parasites *Meniscus pimptator*, *Bracon variator*, *Cabocephalus brevicornis*, *Phanerotoma dentata*, and *Thrytocera spinipennis*. Also a box illustrating the pupation of this insect and its parasites. Also a series of *S. scoliiformis* and parasite and larva, pupa case, and cocoons in situ. Pupa cases of *Trochilium apiforme*. *Sesia asiliformis* and its larva and pupa case, and its parasite *Hemiteles obscurus*, from Hyde Park. Mr. L. W. Newman, the life histories of *Sesia culiciformis* and *S. andreniformis*. Living cocoons of *S. andreniformis*. A birch stump from which the larva of *S. culiciformis* had been removed by birds. Also a case containing type specimens of the British Sesiidæ and some photographs. Also, on behalf of Mr. Edelsten, a stick of willow containing larvæ of *Sesia formiciformis*. Mr. W. E. King, living specimens of *Timandra amatoria* and *Boarmia repandata*, bred the same day.

Mr. Stanley Robinson and Mr. R. G. Evans were elected members.

PAPER.—Mr. L. W. Newman read a paper "On collecting and breeding the Sesiidæ," which is printed in this volume. Mr. Newman was thanked for his paper.

February 26th, 1914.—To commemorate the fusion of the City of London Entomological and Natural History Society and the North London Natural History Society a reception and supper were held at Palmerston Restaurant, Mr. M. Greenwood, jun., M.R.C.S., L.R.C.P., presiding.

March 3rd, 1914.—EXHIBITS.—Mr. L. W. Newman, a ♀ specimen of *Gastropacha ilicifolia*, taken in 1913 at Cannock Chase, by Mr. G. B. Oliver. Mr. Newman stated that fertile ova had been obtained, from which he had a number of living pupæ. Mr. A. W. Mera, a series of *Cidaria suffumata*, including two varieties from East Devon, considered by some entomologists to be a distinct species.

COMMUNICATIONS.—Mr. W. E. Glegg reported having seen, on

February 10th, a flock of over 200 pochards, ♂ and ♀, nine dabchick, and a grey wagtail, at Stoke Newington reservoirs, and on February 25th, a lesser spotted woodpecker at Highams Park. Mr. E. R. Spragg reported having seen a mistle thrush's nest with four eggs near Hale End, on February 22nd.

Miss Mabel Ashmead and Mr. John Fleming were elected members.

Mr. S. Hazzledine Warren, F.G.S., F.Z.S., gave a most interesting lecture on "The Arctic Beds of the Lea Valley and their Correlation," illustrated by numerous lantern slides. (A paper by Mr. Warren on this subject has been published in the Transactions of the Geological Society.) A hearty vote of thanks was accorded Mr. Warren.

March 17th, 1914.—EXHIBITS.—Mr. L. W. Newman, fullfed larvæ of *Abraeus grossulariata*, collected at Bexley, March 16th, 1914, on which date larvæ of all sizes were found on the same bushes. Dr. E. A. Cockayne, *Euchloë cardamines* from Ireland, the females having buff hindwings. Mr. A. W. Mera, his series of *E. cardamines*, including a male with yellow tips to forewings. Mr. V. E. Shaw, a series of *E. cardamines*, some with large discal spots, others with very small discal spots; two very small specimens taken at Caterham in 1892; also a fine ♂ with the usual black tips to forewings rayed inwards. Mr. A. Bacot, photographs of the pupæ of *E. cardamines*, showing the variation in colouring in response to environment. Mr. C. H. Williams, a few varieties of *E. cardamines*, including a ♂ with yellow ground colour and a ♀ with two spots on the underside of forewings. Mr. H. B. Williams, a long series of *E. cardamines* and *abs. turritus* and *citronæa* and other varieties, including large and small-spotted forms, forms with discal spots to hindwings, a ♀ with two spots on the underside of forewings, a ♀ with a small splash of orange on underside of left forewing, and others; also some living pupæ of the species. Mr. A. J. Willsdon, a piece of cork containing some hundreds of ova of *Nyssia hispidaria*. Mr. J. Riches, a moss found in an old greenhouse, which was identified by Mr. Ross as *Funaria hygrometrica*.

Mr. Donald F. Maitland was elected a member.

PAPER.—Mr. H. B. Williams read a paper entitled "The minor variation of *Euchloë cardamines*," illustrated by numerous exhibits.

Mr. A. Bacot proposed and Mr. L. B. Prout seconded a hearty vote of thanks to Mr. Williams for his paper. Dr. E. A. Cockayne and Mr. V. E. Shaw joined in the subsequent discussion.

April 7th, 1914.—EXHIBITS.—Mr. H. Worsley Wood, a fine series of *Xanthia (Mellinia) ocellaris*, lent by Herr Rudolf Püngeler, of Aachen. The series included the following—

I. EUROPEAN.—*X. (M.) ocellaris*, ab *lineago*, Gn., and intermediate forms; a very fine red form from Berlin; a pair of co-types of *ab. intermedia*, Nabich, the ♂ of the usual greyish red, the ♀ yellow. [All these forms, except the Berlin insect, have occurred in England in the Thames Valley locality, but the yellow *intermedia* is of great rarity, and it does not appear from the author's description and figure

(VI. Jahresbericht des Wiener Entomologischen Vereins, 1895) that the varietal name includes both forms].

II. ASIATIC.—(a) From Uralsk (Russian Turkestan), a short series all paler than typical *ocellaris*, and two ab. *intermedia* with lighter ground colour, and the typical white veins replaced by black; (b) from Tien-schan, a very yellow form; (c) from Central Asia, very pale yellow forms with all the markings very indistinct; (d) from the Alexander Mountain district, three yellow strongly marked forms with black veins.

III.—AFRICAN. A group of insects—*ocellaris* ab. *rubra*, *palleago* ab. *austanti* and *gilvago* ab. *algyrica*, all from Batna, Algiers. The exhibitor stated that he and Herr Püngeler were both of opinion that these were probably forms of a distinct but closely allied species.

Mr. J. Riches, a short series of *Sesia culiciformis* from Bexley.

Mr. L. B. Hall demonstrated the conversion of carbonic acid gas into carbonic acid snow by compression. He said that carbonic acid gas has recently been used by the medical profession in the treatment of skin diseases; it was an extremely important factor in organic life, and an important factor in connection with the erosion of rocks.

Mr. W. E. Watson Baker and Mr. F. Weighell were elected members.

Mr. L. B. Hall read a valuable paper entitled "Wayside Notes," his remarks being illustrated by a series of beautiful lantern slides. The paper dealt with erosion by the waves of the sea, the formation of sand dunes, the reclamation of mud banks, the effect of rivers and streams in breaking up the earth's surface, the action of chemical agencies in erosion, earthquakes, the origin of lakes, and the effect of glaciers on land contours. Mr. Hall was cordially thanked.

April 21st, 1914.—EXHIBITS.—Mr. Bernard Cooper, a fine asymmetrical specimen of *L. pulveraria*, bred in March from New Forest ova. The band was missing from the right forewing.

COMMUNICATIONS.—Mr. W. E. Glegg recorded the following migrants—March 31st, 1914, willow warbler at Highams Park; April 10th, 1914, swallow and sand-martin at Staines Common; April 12th, 1914, tree pipit at Hatch Grove; April 13th, 1914, cuckoo, redstart, and a colony of sand-martins at Broxbournebury. Mr. P. J. Hanson, April 13th, 1914, sedge warbler at Cheshunt. Mr. A. G. Hubbard, April 20th 1914, nightingale at Connaught Water.

Mr. C. Nicholson delivered a lecture on "Wasps and their Ways," illustrated by many beautiful photographs and microphotographs thrown on the screen, and by a very complete series of specimens. He also showed some of the more minute organs under the microscope. Mr. Nicholson was heartily thanked for an interesting and exhaustive lecture.

May 5th, 1914.—EXHIBITS.—Mr. I. W. Newman, larvæ of *Argynnis paphia* from Killarney. Mr. A. W. Mera, larvæ of *Phorodesma smaragdaria* which had hibernated in captivity. Mr. L. B. Prout, bred

specimens of *Boarmia repandata* from Devon and Scotland, to illustrate the difference between the two races.

Mr. L. J. Tremayne, President of the Research Section, gave an account of that body's activities. He was cordially thanked for his address.

May 19th, 1914.—EXHIBITS.—Mr. A. W. Mera, on behalf of Mr. B. S. Williams, of Finchley, a melanic specimen of *Biston hirtaria*, bred at Finchley from wild pupæ. This melanic form is of great rarity, only two other specimens being known. Mr. Mera also exhibited ♂s of *Saturnia carpini* from Braemar and from Essex marshes, the Scotch specimens being smaller than those from Essex and distinctly paler, particularly the hindwings. Mr. L. J. Tremayne, living specimens of *Spilisoma mendica* from Farnham, Surrey. Mr. A. J. Willsdon, the reciprocal hybrids of *Biston hirtaria* and *Nyssia zonaria*. Mr. J. Riches, larvæ of *Boarmia gemmaria*, imagines of *Hemerophila abruptaria* from Holloway, *Saturnia carpini* from Kent, *Bombyx rubi* from Eastbourne, *Spilisoma mendica* from Finchley, all bred in 1914. Mr. C. Williams, a series of *Boarmia repandata* from the North of England, Galashiels, New Forest and other districts.

Mr. L. J. Tremayne, *Hesperis matronalis* (dame's violet), *Polygonatum multiflorum* (Solomon's seal), *Allium ursinum* (wild garlic), *Orchis mascula* from near Alton, *Anthriscus vulgaris* and *Polygonum bistorta* from near Farnborough. Replying to Mr. Robbins, Mr. Tremayne said he found that *Anthriscus vulgaris* took the place of *Anthriscus sylvestris* in small areas; in most cases he had found it only in small areas. He had found the species growing together in Bedfordshire.

COMMUNICATIONS.—Mr. W. E. Glegg reported that with Mr. Hanson he paid a visit on May 14th to the only well-authenticated breeding-ground of the red-shank in the Society's district; they saw about twelve pairs of the birds apparently nesting, and one nest with four eggs.

Mr. Victor Blum was elected a member.

Mr. E. B. Bishop, Chairman of the Archaeological Research Committee, described that committee's work. Mr. S. Austin spoke of Broxbourne Church, Mr. E. Chapman of Beaulieu Abbey, Mr. L. J. Tremayne of Thaxted Church, Mr. Marshman Watison of the Church of Harrow-on-the-Hill, and Mr. Bishop of Little Maplestead Church. A vote of thanks was accorded these gentlemen.

May 30th, 1914.—Excursion to Clandon led by Mr. V. E. Shaw, The following species of lepidoptera were observed:—*Pieris brassicae*, *napi*, *Lycæna icarus*, *Coenonympha pamphilus*, *Nisioinades tages*, *Nemeobius lucina*, *Uropteryx sambucaria*, *Tephrosia punctularia*, *Asthena candidata*, *Acidalia remutaria*, *Eupithecia vulgata*, *Melanippe montanata*, *Melanthia fluctuata*, *Camptogramma bilineata*, *Fidonia atomaria*. Ova of *N. lucina* were found on leaves of the primrose and cowslip.

June 2nd, 1914.—EXHIBITS.—Mr. J. Riches, *Colias edusa* ab. *helice*,

bred autumn, 1913, from Eastbourne ova. Mr. A. W. Mera, a foreign hawk-moth taken alive at the West India Docks, and living larvæ of *Psilura monacha*.

Mr. R. W. Robbins reported that several members of the Research Section had spent a week-end in the neighbourhood of Oxted, and there found *Myosotis sylvatica* (wood forget-me-not), on the Downs several orchids, including six or eight plants of *Ophrys muscifera* (fly orchis), and in the beech woods *Neottia nidus-avis* (bird's nest orchis).

Miss Clifton (a member of the Royal Society for the Protection of Birds) gave an interesting address on "The Winged Citizens of London," her remarks being illustrated by lantern slides prepared from Lord Lilford's illustrations.

The Chairman conveyed the thanks of the meeting to Miss Clifton.

June 6th, 1914.—On the ornithological ramble at Hale End the species observed nesting were:—Tree pipit, marsh tit, nuthatch, bullfinch, robin, garden warbler, thrush, cole tit, tree sparrow, starling, hawfinch, swallow, moorhen, wren, chaffinch, willow warbler, blue tit, blackbird, great spotted woodpecker, and hedge sparrow.

June 16th, 1914.—EVENING FIELD MEETING AT CHINGFORD.—The following species were observed:—

LEPIDOPTERA.—*Tortrix ribeana*, *T. sorbiana*, *Ptycholema lecheana*, *Elachista argentella*, *Crambus hortuellus*, *Bactra lanceolana*, *Sericoris lacuana*, *Hyperomeuta padellus* (larvæ), *Penthina variegatea*, *Acidalia aversata*, *Miana arcuosa*, *Metrocampa margaritaria*, *Cabera pusaria*, *Heptamelus lupulinus*, *Acronycta psi*, *Orthesia upsilon* (larvæ on Chingford willows), *Cossus ligniperda* (young larvæ on Chingford willows), *Melanippe sociata*.

BIRDS.—Chiffchaff, Willow wren.

June 27th, 1914.—EXCURSION TO LEITH HILL, led by Mr. V. R. Shaw, F.E.S.—The following species of lepidoptera were observed:—*Epinephele janira*, *Coenonympha pamphilus*, *Bupalus piniaria*, *Bromolocha fontis*, *Melanippe sociata*, *Ematurga atomaria*, *Nemeophila russula*, *Eucosmia undulata*, *Eupisteria oblitterata*, *Eupithecia lariciata*, *Thera firmata*, *Hysipetes sordidata*, *Macaria liturata*, *Melanippe montanata*, *Iodes lactearia*, and larvæ of *Hadina pisi* and *Pieris brassicae*.

July 4th, 1914.—EXCURSION TO COLNEY HEATH, led by Mr. C. S. Nicholson.—At Colney Heath is to be seen the interesting flora of the sands and gravels of the sloping banks of the valley through which one of the head waters of the River Colne flows. The flora of the wet banks of the stream clearly shows that the district is one in which the ecological features of plant life can be well examined.

July 25th, 1914.—St. Alban's Cathedral was visited, Mrs. Plomer Young conducting the party over the building; a tour of the exterior was also made.

September 1st, 1914.—EXHIBITS.—Mr. H. B. Williams, on behalf of Mr. Shaw, ova and larvæ of *Lycaena argiolus*, also a specimen of the white form of the harebell. Mr. W. E. King, specimens of *Zizera minima* taken at Horsley in June, including three fine obsolete forms. Mr. H. B. Williams, a short series of *Euchloë cardamines*, bred in May, 1914, including two specimens (♂ and ♀) with an extra spot on the underside of the forewing immediately below the discoidal; varieties of *Rumicia phlaeas* from Wimbledon, of *Aricia medon* and *Polyommatus icarus* from Boxhill, Banstead &c., and gynandromorphs of *Amorpha populi*, bred August 2nd, 1914, among a few second brood examples.

PAPER.—Mr. Williams read a short paper on "The Season's Collecting," for which he was thanked. (Vide *Ent. Rec.*, xxvi., 270.)

September 15th, 1914.—EXHIBITS.—Mr. C. H. Williams, an interesting and varied series of *Polyommatus icarus*. Mr. W. E. King, series of *Phigalia pilosaria* from Epping Forest, and *Lycia hirtaria* from North London. Mr. H. Goullee, a collection of caddis cases, and specimens of the water scorpion and great water bug.

Mr. W. E. Glegg reported nests of the great spotted woodpecker, bullfinch, and tree sparrow in the Society's sanctuary. In the tree sparrow's nest were nine eggs, an unusual number; he could not say if all the eggs were laid by one bird.

PAPER.—Mr. H. Goullee gave an interesting address on "Life Histories of some Aquatic Insects," illustrated by a series of fine lantern slides. A hearty vote of thanks was accorded Mr. Goullee.

October 6th, 1914.—EXHIBITS.—Mr. G. H. Heath, a fine series of *Boarmia repandata*, including a number of ab. *conversaria*. Mr. C. H. Williams, some specimens of *Polyommatus icarus* from Ireland, also some fine females from England, including ab. *antico-striata* and an obsolete male. Mr. W. E. King, a series of *P. icarus*, mostly taken at Horsley this year, including abs. *striata*, *obsoleta*, *antico-obsoleta*, *sub-obsoleta*, *postico-apicalis*, *costajuncta*, *melanotoxa*, &c.; also, on behalf of Mr. Loney, four fine specimens of *Cerura vinula*. Mr. L. W. Newman, a gynandromorphic *Polyommatus icarus*, right forewing ♀, remainder ♂, except one red lunule on each hindwing; another *P. icarus*, chiefly ♀ but having small ♂ patches, a gynandromorphic *Agriades thetis*, ♀ with a splash of ♂ colour along the costa of the right forewing; a gynandromorphic *Agriades coridon*, ♀ with a small splash of ♂ colour in right forewing; a specimen of *Agriades coridon* ab. *minutissimus*; a series of *Gastropacha ilicifolia*, bred from the ♀ taken at Cannock Chase in 1913 by Mr. G. B. Oliver, and a curious *Zygæna*, small and having four spots only, taken by Mr. Grant of Gravesend on September 3rd, 1912. It was suggested the specimen might be a second brood example of *Z. filipendulae*. Mr. H. B. Williams, a long series of *Agriades coridon* taken in August, 1914, in North Herts, including series of abs. *semisyngrapha*, Tutt, *inaequalis*, Tutt, *parisiensis*, Gerh, a fine series of various obsolete and striate forms, a ♀ of the colour of *Coenonympha pamphilus*, a ♀ with a bluish suffusion on the underside of one hindwing only, numbers of well-marked ♀ upper sides, dark and

light undersides, &c. Also a series of *Polyommatus icarus*, including fine blue ♀s, interesting ♂s with pale blotches, and abs. *melanotoxa*, Marrott, *biarcuata*, Tutt, *basijuncta*, Tutt, *costajuncta*, Tutt, forms combining *melanotoxa*, *costajuncta*, *basijuncta*, &c., three ab. *transiens*, Obth., a fine ♀ ab. *antico-striata*, Tutt, four fine ab. *subobsoleta*, Tutt, two of which had the hindwings almost devoid of spots and were taken at the same time, two fine ♂ ab. *obsoleta*, Clark, and other interesting forms.

Mr. V. E. Shaw, pupæ of *Cyaniris argyolus*. Mr. A. J. Willsdon, larvæ, pupæ and imagines of a species of *Micro-lepidoptera* found feeding in a cargo of peanuts captured from the Germans; the species has not been identified.

Mr. C. S. Nicholson, Herbarium specimens representing the aggregate species *Festuca myuros*, L., showing the segregates *F. ambigua*, *F. pseudo-myuros*, and *F. sciuroides*, drawing attention to the chief differences between them. He also exhibited for comparison the allied species *F. uniglumis*.

Mr. J. V. C. Braithwaite was elected a member.

Mr. A. G. Hubbard, B.Sc., read a paper on "The Finch Family," illustrating his remarks by a series of lantern slides prepared from his own photographs.

An interesting discussion followed, and Mr. Hubbard was heartily thanked.

October 20th, 1914.—EXHIBITS.—Mr. L. W. Newman, a series of *Dianthoeia barrettii*, bred from wild larvæ and pupæ from Co. Cork and South Devon, the specimens being very varied and some showing a tendency to melanism; also a very varied series of *Boarmia repandata* including melanic specimens, ab. *conversaria*, and very pale forms, all bred from wild larvæ taken in the Wye Valley.

Mr. A. W. Mera, a series of *Psilura monacha* inbred from Ringwood parents. The series varied from typical to black, the ♂s showing stronger tendency to melanism than the ♀s; Dr. E. A. Cockayne, a series of *Agriades coridon* from North Herts, including two very fine ab. *semisyngrapha* and five fine obsolete forms, also abs. *subobsoleta* and *postico apicalis* of *Polyommatus icarus*. Mr. L. A. E. Sabine, a fine variety of *Melitaea artemis* from Co. Sligo; also a specimen of *Polyommatus icarus*, having forewings and body ♂, hindwings ♀. Dr. Cockayne stated that, though only examined under a low microscope power, he thought he could detect androconia on the forewings, showing that the specimen was a gynandromorph.

Mr. J. Riches, a series of *Euchloris smaragdaria* including ab. *obsoleta*, Burrows, bred this year. Mr. H. B. Williams, two pupæ of *Euchloë cardamines*, one ochreous and the other bright green, both of which pupated on the same day in the same box.

Mr. C. S. Nicholson, Herbarium specimen of *Ballota nigra* and *Ballotta nigra* var. *borealis*, the latter being very common in the West of England.

Mr. D. H. Meares read a paper on "British-breeding ducks," which had been prepared by his brother, Mr. C. S. Meares, that gentleman

being on active service with the U.P.S. Corps, Royal Fusiliers. The paper is printed in these Transactions.

In reply to Mr. W. E. Glegg, Mr. Meares said it was a common characteristic of all species of ducks that a large number appeared never to breed. The explanation might be that they were immature birds bred late in the previous year, or that there were not mates for them. The plumage of ducks was a difficult point, for all ducks moulted four times a year.

Messrs. Meares were cordially thanked.

November 3rd, 1914.—EXHIBITS.—Mr. H. B. Williams, four *Aricia medon* showing obsolescence in the underside spotting; a striate underside of *Agriades thetis*, *Coenonympha pamphilus* ab. *pallida*, Tutt, five specimens from North Herts, *Rumicia phlaeas* ab. *infra-radiata*, Tutt, an ab. *caeruleo-punctata*, with pallid blotches on both forewings, and abs. *radiata*, Tutt, and *obsoleta*, Tutt, from Wimbledon, a specimen with left forewing almost entirely white from Herts, and other forms.

Dr. Cockayne, four extreme suffused forms of *Rumicia phlaeas*, from Japan. Mr. L. A. E. Sabine, a storebox of *noctuae* from Co. Sligo, 1914. The series of *Agrotis tritici* were very fine, and a nice form of *Epunda lichenea* was also represented.

Mr. W. E. King, *Aricia medon* from Wendover, including an immense ♀, obsolete undersides and one partially striated; also *Zizera minima* from Horsley, including abs. *obsoleta* and *extrema*.

Mr. A. W. Mera, a series of *Boarmia repandata*, showing the marked darkening which has taken place in the general facies of this species in the London district during the last 20 years.

Mr. E. Chapman gave an instructive address on "The Middle Ages in the Wey Valley," which is printed in these Transactions.

After a discussion in which Messrs. H. B. Williams, Greenwood, Bishop, Tremayne, and Austin took part, a vote of thanks was accorded Mr. Chapman.

November 17th, 1914.—EXHIBITS.—Mr. W. E. King, a series of *Agriades coridon* from North Herts, including ab. *semisyngrapha*, Tutt, ab. *obsoleta*, ab. *costajuncta*, ab. *basijuncta* and other fine forms; also some light and dark forms of the ♂ from Lewes.

Mr. A. W. Mera, *Cosmotriche potatoria*, two light ♂s, one quite yellow, bred from ova from Wicken Fen; also a ♂ with light blotches from Wansford.

Mr. Ross, *Lunularia cruciata* (hepatic) in fruit, found near Dorking, November 8th; this species very seldom fruits in Britain.

Mr. L. B. Hall, *Tortula cernua* (moss) from Aberford, Yorks, the only known British locality; *Phleum boeumeri*, Shrad., a rare grass from Letchwood, Herts, and *Mentha aquatica*, L., var. *citrata*, Ehrh., from Northaw, Hants.

Mr. J. Riches read an instructive paper on "Chrysanthemums." After tracing the history of the introduction of the plant into Europe, Mr. Riches said that at one time the chrysanthemum grew wild over a

great area of Northern Korea and Northern China, its flowers being yellow, and it being known as "the golden plant." There was reason to believe that the natural yellow chrysanthemum was crossed with an allied member of the family similar to the oxeye daisy of English meadows. From this cross were obtained white as well as yellow flowering plants. In evidence of the early white type to assert itself, Mr. Riches mentioned that there was a tendency to produce early flowering varieties; seedlings of present day varieties often produce a sportive plant, which flowered some months earlier than either of the immediate parents, the flowers of such sports always being white, the colour of the original parent; in colour sports it is just the reverse. The flowers of many varieties seemed to degenerate after a few years, and these had to be discarded. Hundreds of new varieties were sent out by growers each year, but many failed to receive favour because of their weak constitutions or through their flowers not being up to standard. Many varieties were obtained from sports, the stem that produced the sport being propagated.

An interesting discussion followed on several points, and a vote of thanks was cordially passed to Mr. Riches.

December, 1st 1914.—EXHIBITS.—Mr. H. B. Williams, a regularly halved gynandromorph of *Fidonia pinivaria*, left side ♀, right ♂; a ♀ specimen of *Ematurga atomaria* with wing coloration of the ♂; a ♀ *Euchloë cardamines* with a splash of ♂ orange colour on underside of left forewing; a regularly halved gynandromorph of *Amorpha populi*, left side ♀, right ♂; a mixed gynandromorph of the same species, body ♂ left wings and antenna ♀, right antenna and (apparently) wings, intermediate between the two sexes; and eight specimens of *Agriades coridon* ab. *inaequalis*, Tutt. Mr. L. B. Prout, *Cidaria truncata* bred from a Scottish locality and *C. immanata* from the same locality, showing considerable variation. Mr. A. W. Mera, a mixed gynandromorph of *Saturnia carpi*, antennæ intermediate, right side predominantly ♀, but with small patches of ♂ coloration, left side predominantly ♂ but with large ♀ patches, and a gynandromorph of *Boarmia repandata*, left side ♀, right ♂. Mr. V. E. Shaw, a gynandromorph of *Amorpha populi* bred by himself, June 10th, 1909, left side ♂, right side ♀, the antennæ, genitalia and wing markings being equally divided from the centre of the body. Dr. E. A. Cockayne, four gynandromorphous *Amorpha populi*, three being predominantly ♀ in their internal organs, having ovaries but no testes, the fourth predominantly ♂. All showed a mixture of male and female parts in their external genitalia; a *Smerinthus* hyb. *hybridus* (the female of which is always gynandromorphous); two gynandromorphs of *Anthrocera hippocrepidis* (both doubtful); a heterochroic gynandromorph of *Hemerophila abruptaria*, right side ♂, ab. *fuscata*, left side ♀, typical; a heterochroic gynandromorph of *Abraaxas sylvata*, right side ♂ ab. *pantarioides*, left side ♀ typical; 37 gynandromorphous *Agriades coridon* from Royston, with one side smaller than the other, and having blue scales and androconia on the small side, one having blue scales and androconia on both sides; two *Agriades coridon* with streaks of

blue colour; a symmetrical gynandromorph of *Polyommatus icarus* having forewings predominantly ♂, hindwings predominantly ♀, and a predominantly ♀ gynandromorph of the same species with streaks of ♂ colour on right forewing and both hindwings, androconia were numerous on the ♂ areas, and the external genitalia purely ♂. Also drawings of dissections of gynandromorphous lepidoptera of various species.

Mr. C. S. Nicholson, herbarium specimens of *Koeleria vallesiaca*, Ascheron, from an outcrop of carboniferous limestone near Weston-super-Mare, and *Koeleria cristata*.

Mr. Glegg reported having seen numerous redwings, whereas they were scarce last year.

Messrs. A. J. Willsdon and C. B. Smith were elected auditors.

PAPER.—Dr. Cockayne gave an interesting and instructive address on "Gynandromorphism," a resumé of which is printed in this volume.

On the proposition of Mr. L. B. Prout, seconded by Mr. H. B. Williams, a hearty vote of thanks was tendered to Dr. Cockayne.

December 15th, 1914.—EXHIBITS.—Dr. E. A. Cockayne, a larva of *Noctua umbrosa*, bred from ovum laid by a ♀ taken in N. Lincs., August, 1914. Also photographs of the following *Agriades coridon*, from Royston.

1. A very asymmetrical underside, the left side larger than the right, and near ab. *parisiensis*, Gerh, the right side typical. The specimen was gynandromorphous, and the exhibitor suggested that the asymmetry was a form of heterochroism.

2. An example not gynandromorphous, which showed possible heterochroism. Very unequal in size on the two sides, both sides as brown as a normal ♀, the orange lunules much larger on the right side. The underside typical on the left wings, near ab. *parisiensis* on the right, the asymmetry being such that no two spots were similar on the two sides.

3. A microphotograph of a portion of wing from a gynandromorphous *Agriades coridon* from Royston, showing three androconia.

Mr. L. B. Prout, a short series of *Melanthia bicolorata*, bred from Forbes ova, showing an interesting modification of the *plumbata* form of variation, the forewing being largely infuscated, but with parts—in particular a broad subterminal line—remaining white, while the hindwing showed infuscation in the terminal region only.

The Treasurer's statement, and the reports of the Council, the Oological Curator, the Entomological Curator, and the Librarians were read and adopted.

A set of Rules was submitted and adopted as the Rules of the Society.

The following Officers were unanimously elected:—

PRESIDENT.—Dr. E. A. Cockayne, M.A., M.D., M.R.C.P., F.L.S., F.E.S.

VICE-PRESIDENTS.—Mr. A. Bacot, Rev. C. R. N. Burrows, Dr. T. A.

Chapman, Messrs. M. Greenwood, jun., F. J. Hanbury, A. W. Mera, L. B. Prout and R. W. Robbins.

TRUSTEES.—Messrs. A. W. Mera, C. S. Nicholson and L. B. Prout.

LIBRARIANS.—Messrs. W. E. Glegg and A. L. Mera.

CURATORS.—Messrs. S. Austin, C. S. Nicholson and A. J. Willsdon.

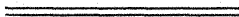
PRESIDENT OF THE RESEARCH SECTION.—Mr. E. B. Bishop.

TREASURER.—Mr. F. G. DELL.

SECRETARIES.—Messrs. J. Ross and H. B. Williams.

Messrs. F. B. Cross, L. B. Hall, L. W. Newman, H. E. Stevenson and H. Worsley Wood were elected members of the Council.

A vote of thanks was accorded Mr. L. B. Prout for his services as President.



EXTRACTS FROM THE COUNCIL'S REPORT, 1914.

(Adopted at the Annual General Meeting, December 15th, 1914.)

In their first Annual Report, the Council of the London Natural History Society wish to emphasize that the amalgamation of the City of London Entomological and Natural History Society and the North London Natural History Society, has already been completely justified. They desire to assert that it was well that the amalgamation was carried through a year ago, since it has enabled the difficult circumstances created for such Societies by the war now being waged on the Continent, to be met with a strength and resource that could not have been furnished by either of the old Societies singly.

The organisation of the Society for research work has been renewed under the able guidance of Mr. L. J. Tremayne, as President of the Research Section.

In the early part of the year the meetings were well attended and entirely successful. The formation of the new Society was celebrated at a supper, held at the Palmerston Rooms in February, when an enjoyable evening was spent under the genial presidency of Mr. M. Greenwood. Some of our members are on active service, some are doing duty as special constables, and for various organisations, and others have been engaged at business during the evening through the reduction of office staffs by military duties. Consequently the attendance at meetings in the autumn was not so good as it was earlier in the year, but this was unavoidable, and not altogether regrettable, for your Council have learnt, with pleasure, that the Society's members answered promptly to the call for the protection and service of the Homeland in the hour of peril.

Your Council has decided to place on record a list of those members who are on active service; they are:—

Captain R. S. Gwatkin Williams, R.N.

Lieutenant Culpin, R.A.M.C.

Lieutenant J. W. Brown, Army Service Corps.

Second-Lieutenant J. P. Pearce, 2nd Essex Regt.

Col. Sergt. F. W. J. Jackson, Inns of Court Rifles.

Corpl. R. C. Barnes, Royal Fusiliers.

L. Eynon, Sportsman's Battalion, Royal Fusiliers.

T. H. Archer, Queen's Westminster, 16th London.

C. L. Collenette, Penang Maxims.

J. V. C. Braithwaite, R.A.M.C.

T. W. Brooke, Inns of Court O.T.C.

Howard Digby, Royal Engineers.

E. B. Latham, 1st Batt. London Rifle Brigade.

R. Latham, 1st Batt. London Rifle Brigade.

S. G. Lewis, University and Public School Batt. Royal Fusiliers.

F. Reynolds, 2nd Batt. Artists Corps, 28th County of London.

A. K. Barratt, R.A.M.C.

T. E. Legg, R.A.M.C.

A. L. Mera, 10th Batt. Royal Fusiliers.

(Our President, Dr. Cockayne, has recently accepted a temporary post under the Admiralty).

Though the year's work has suffered from the dislocation of business arrangements, and the imperative call of national service, arising from the war, your Council regards the year's work of the Society with no little satisfaction. More has yet to be done before everything runs with perfect smoothness, but this we hope to secure in time; meanwhile, your officers would ask members in case of inadvertence, omission or seeming neglect, for a continuance of that kind forbearance that has hitherto been accorded them.

The branches at Chingford and Woodford continue to do good work. It is with regret that we lose the services of Mr. J. O. Braithwaite as Secretary at Chingford. The branch, at the end of the fifth year of its existence, may be considered to have attained a state of healthy adolescence. Notwithstanding that several former members have left the district during the year, the accession of new members and associates brings the total of names on the rota to 49, a slight increase over that of 1913. During the latter part of the year 1914 the Woodford Branch showed a tendency to fall from the flourishing state that characterised its earlier stages. On the whole, however, the year has been satisfactory. The Chair for 1915 has been kindly accepted by Robt. Armstrong-Jones, Esq., M.D., B.S., F.R.C.P., F.R.C.S., and we must congratulate ourselves that Dr. Jones is able to give us his valued services.

Mr. Dell's statement as Treasurer, submitted to the Council on December 1st, showed a balance of receipts over payments and liabilities of £34 9s. 2½d.; this includes £15 representing life subscriptions. Many subscriptions are outstanding, but owing to the circumstances prevailing members have not been pressed for payment. Members are asked to bear in mind that the past twelve months were a period of light expenditure, owing to no reports and no proceedings being published in the Society's first year. Such outlay will fall upon the revenue of 1915 and succeeding years, and members will recognise the necessity of the Society receiving adequate financial support. The Treasurer's audited account shows that the balance at December 14th was £27 16s. 11d., including £15 life composition fund.

REPORT of the RESEARCH SECTION for 1914.

1. Besides myself the Research Board for 1914 has consisted of Mr. C. S. Nicholson, Mr. H. B. Williams, Mr. R. W. Robbins, Mr. W. E. Glegg, and Mr. E. B. Bishop, every Committee being thus represented. Mr. C. S. Nicholson has acted as Vice-Chairman, and Mr. H. B. Williams as Secretary during the year.

2. The principal matter needing attention has been the automatic enlargement of the local district owing to the amalgamation of the two Societies. The Board considered that the only possible district for the amalgamated Society was the extension of the North London radius, so as to take in the corresponding ground south of the Thames. They accordingly passed a resolution to that effect and transmitted it to the Council. It is understood that the matter has been, or is in the course of being, settled on these lines, and the Board's subsequent deliberations proceeded on the footing of its adoption. A sub-committee was appointed to sub-divide the district, and its report is sent herewith. Each Committee has also been circularised to know whether it is willing to take over the new area, and in cases where replies have not been wholly favourable the Board have endeavoured to make arrangements to meet the difficulty, which it is hoped will thus be overcome without the necessity of forming any actually new committees.

3. Renewed efforts have been made to form Committees for Photography and Mammalia, and some slight success has been achieved with regard to the latter, two competent gentlemen being now waiting in readiness to take part in such a committee when formed, one of whom will be able and willing to act as chairman. But although many personal requests have been made, and the matter has been publicly mentioned both at the central meetings of the Society and at the branches, we have not been able to obtain any other recruits, and in my opinion two or three more at least are necessary to give the Committee a fair chance. Members are earnestly requested to do what they can to secure these as soon as possible, so that the committee can be got under way in 1915. The same remark applies equally strongly to the proposed Photographic Committee, which one would think ought to be easier of attainment, but for which we are sorry to say no one has yet come forward.

4. The Board has endeavoured during the year to get into direct and personal touch with all the Committees and take an active interest in their work. Circulars have been sent out advising various lines to bring them into co-ordination, and in all cases these have been well received. The Board further organised on May 23rd to 25th a week-end outing of the Research Section to the Oxted district. Nine members and one visitor attended, and the outing was much enjoyed and considered a great success. It is hoped that this will become an annual event, as we conceived it to be an excellent idea to keep up the spirit of the members, and give them an opportunity of collaborating in the field. The occasion, this year was, of course, utilised to note the

first records of the Southern district, and botanically at least it may be said to have been successful from a scientific standpoint also, as several most interesting species were recorded.

5. The Reports of the five Committees are appended herewith. I have only to add that they are all in excellent condition, and have been working actively and heartily throughout the year.

6. The Board suggest the nomination of Mr. E. B. Bishop as President of the Section for 1915.

(Sgd.) LAWRENCE J. TREMAYNE.

REPORT of COMMITTEE on SUBDIVISION of LOCAL DISTRICT SOUTH of the THAMES.

The proposed subdivision is based chiefly on the geology of the various areas, as the nature of the soil has great influence on the character of the country and the prevailing flora, hence also on the fauna. The object aimed at has been to secure a number of areas of workable size that shall each have a characteristic soil and type of country, and it is believed that the comparative study of the records for such areas would have more interest and value than if arbitrary boundaries were chosen. At the same time, with the exception of the county boundary between Kent and Surrey, which has been retained for convenience of comparison with county floras and faunas, the boundaries chosen are such as can be easily followed—roads, streams, and railways, and in one or two places, footpaths.

The subdivisions recommended are as follows :—

	BOUNDARIES.	GENERAL CHARACTER.
1. Weybridge ..	N. the Thames ; W. and S. District boundary ; E. from Hampton Court Station, the railway to Surbiton Junction thence through Claygate and Oxshott to District boundary.	Practically all Bagshot Sands with heaths, &c., and round Chertsey the lower river gravels.
2. Wimbledon ..	N. and W. the Thames ; E. River Wandle ; S. Railway from Kingston through Raynes Park to Wimbledon Junction, thence through Morden to the Wandle.	Chiefly higher river gravels of Putney and Wimbledon Commons and Richmond Park.
3. Chessington ..	N. Boundary of 2 ; W. the Thames and boundary of 1 ; S. and E. District boundary, road from Bookham Church to Fetcham and Leather.	Almost all lowlying country of London Clay, with Commons of London Clay and gravel at Epsom, Ashted and Bookham. Chessington village is cen-

	BOUNDARIES.	GENERAL CHARACTER.
	head Station, footpath and road to Ashted, Epsom and Ewell, thence S. of Nonsuch Park to Cheam, Sutton, Carsbalton and to the Wandle at Beddington and thence northwards.	tral in the division in the midst of typical country.
4. Norwood	W. and S. River Wandle to Waddon, thence main road through Croydon to Coombe Lane, Addington and County boundary; N. Thames; E. County boundary.	Chiefly lower river gravels of Streatham, Tooting and Mitcham, hills of London Clay round Norwood, and Blackheath and Thanet Sands round Shirley.
5. Banstead	W. and N. Boundaries of 3 and 4; E. main road from Croydon to Mersham; S. Boundary of 7 to Merstham Church.	Chalk with cappings of Woolwich beds and Thanet Sands at Headley and Watton, &c., and along the northern edge.
6. Caterham	N. Coombe Lane and Addington Road; W. Brighton main road; S. Boundary of 7; E. County boundary.	Chalk with capping of sand at Worms Heath and on the northern edge; contains the highest chalk ridges.
7. Holmesdale	N. Railway from Betchworth to Reigate, main road to Merstham, just S. of Church, thence road and footpath (the "Pilgrims' Way") at foot of downs to County boundary; E. County boundary; S. District boundary.	The valley of Gault clay and the Greensand ridges below the chalk. A few small spurs of chalk unavoidably project into the northern edge.
8. Blackheath	N. River Thames to Greenwich, thence railway from Greenwich Station through Woolwich to R. Cray at Crayford (boundary of 9); W. County boundary; E. the Cray to Orpington; S. road from Addington to Hayes turning right past Coney Hall to Keston Church, thence road and footpath direct to Farnborough, and road direct to Orpington and R. Cray.	A large district but homogeneous and difficult to divide. Chiefly Blackheath Sands (hence name) and Woolwich Beds, with some London Clay in valleys. Much sandy common land — Blackheath, Hayes, Chislehurst, Bexley, Abbey Wood, &c.
9. Kent Marshes	N. River Thames; S. Railway from Greenwich	All alluvial marsh land except small patch of chalk

	BOUNDARIES.	GENERAL CHARACTER.
	through Woolwich and Dartford to boundary at Northfleet.	at Dartford.
10. Darenth	N. Boundary of 9; E. District Boundary; W. River Cray to Orpington, thence road to Farnborough; S. main road from Farnborough to Sevenoaks, to the top of the Halstead Tunnel, thence bye road to Shoreham Castle on Darent, River Darent to Chatham main line, and railway thence to boundary.	Chalk subsoil throughout, but capped with large areas of Thanet Sand, on which are extensive woods—Darenth Wood, Joydens Wood, Hallards Wood near Chelsfield, &c.
11. North Downs ..	N. Boundary of 8 and 10; W. County boundary; E. District boundary; S. "Pilgrims' Road" from Titsey to Chevening Park continuing direct across the Park and by footpath and road to Otford Station, thence footpath and road direct to Kem-sing.	All high chalk land with a good deal of "clay with flints," i.e., weathered chalk, on the highest parts. Few villages and many small woods.
12. Westerham ..	N. Boundary of 11; W. County boundary; S. District boundary.	Gault in valley below the chalk ridge. Greensand ridges beyond. Similar to 7.

(Sgd.) R. W. ROBBINS.
E. B. BISHOP.

ARCHAEOLOGICAL COMMITTEE. REPORT for 1914.

1. During the year the Committee has made the following inspections:—

- (a) January 31st, East Ham Parish Church, Essex.
- (b) April 25th, Darenth Church, Kent.
- (c) July 11th, Boxgrove Priory Church, Sussex (annual week-end outing).

The records of above inspections are being prepared and will be deposited in the Society's library.

2. The following papers have been provided at the instance of the Committee for the Society's syllabus:—

Read at Chingford Branch—

- (a) February 27th. "A plea for the preservation of our Ancient Buildings," by E. B. Bishop.

Read at Salisbury House—

(b) May 19th. "The Records of the Archaeological Committee," by Members of the Committee.

(c) November 3rd. "The Middle Ages in the Wey Valley," by E. Chapman.

Mr. Bishop has presented his paper to the Library.

3. The Committee organised a visit of the Society to St. Alban's Cathedral on July 25th.

4. In view of the extension of the Society's local district to include a 20 mile radius south of the Thames the work of the Committee will in future embrace the increased area.

5. Mr. A. Bacot having proceeded to Africa to take up professional duties has resigned membership of the Committee. The number of members now stands at nine.

(Sgd.) E. B. BISHOP, *Chairman*.

(Sgd.) S. AUSTIN, *Hon. Sec.*

November 3rd, 1914.

ORNITHOLOGICAL RESEARCH COMMITTEE. ANNUAL REPORT for 1914.

The number of birds recorded in the district now stands at 137, as against 136 last year. The nesting species number 87, the same as that of last year. The new occurrence is that of the

Mealy Redpole (*Linota linaria*). More than a dozen of this species were caught in a garden in Chingford, in November, 1913. Mr. A. G. Hubbard, who vouches for the record, saw seven of the birds and placed two in his aviary.

Other interesting records are as follows:—

Long-Eared Owl (*Asio otus*). One shot at Chingford, October 11th, 1913, by Mr. W. W. Hartwell. Reported per W. E. G.

Little Owl (*Athene noctua*). Four young were hatched in an apple tree, afterwards living in a rabbit hole, at Enfield, in 1913. Reported by Mr. R. B. Lodge per W. E. G. This species was observed also at Chingford, on August 16th, 1913, and March 13th, 1914, and two young birds on August 1st, 1914. Reported by Mr. W. W. Hartwell per W. E. G.

Spotted Crake (*Parzana maruetta*). One shot at Chingford, September 26th, 1914. Reported by Mr. W. W. Hartwell per W. E. G.

Lesser Redpoll (*Linota rufescens*). Nest with eggs on east side of Epping High Road, June 25th, 1914. Reported by Mr. A. G. Hubbard.

Pochard (*Fuligula ferina*). A flock of over 200 male and female was observed on Stoke Newington Reservoirs, on February 10th, 1914. Reported by Mr. W. E. Glegg. This is the largest flock recorded in the district.

Teal (*Nettion crecca*). A small flock was seen on Walthamstow Reservoirs, on January 27th, 1914. Reported by Mr. W. E. Glegg.

Tufted Duck (*Fuligula cristata*). Nested in new Public Park, Winchmore Hill, 1913. Reported by Mr. R. B. Lodge per W. E. G.

The Committee has held during the year nine meetings, including five informal meetings, and seven excursions. Of the latter mention may be made of the visit to the Heronry at Wanstead Park. It is gratifying to note that the authorities are affording the birds all possible protection. The rooks, which are a menace, are not permitted to nest on Heronry Island, any nests built being destroyed. The colony is evidently in a thriving condition, as the keeper stated that there were 56 nests in 1914, being three more than in 1913.

One hundred and thirty-one birds have been ringed during the year under the "British Birds" marking scheme. Although this is less than the previous year it cannot be considered as unsatisfactory, as the ringing of all the Tits has been discontinued, and it must be borne in mind that this particular group formed a large part of the birds ringed by the Committee.

Some interesting recoveries are to be recorded:—

Great Tit, ringed at Hale End, January 12th, 1911, recovered same place, August 14th, 1914.

Great Tit, ringed at Woodford, December 29th, 1912, recaptured same place, December 31st, 1913.

Great Tit, ringed at Woodford, June 1st, 1913, recovered same place, March 11th, 1914.

Blue Tit, ringed at Hale End, June 4th, 1913, recovered at Walthamstow, December 24th, 1913.

Nuthatch, ringed at Woodford, January 10th, 1913, recaptured same place, January 12th, 1914.

Common Tern, ringed at Blakeney Point, June 23rd, 1914, recovered at Felixstowe, July 28th, 1914.

Common Tern, ringed at Blakeney Point, June 23rd, 1914, recovered at Lowestoft, July 29th, 1914.

The photographic collection has made some progress, but still further support is invited.

The Committee provided three items for the syllabus:—On June 2nd, a Paper, "Winged Citizens of London," by Miss Clifton (R.S.P.B.); on June 6th, a ramble, including a visit to the Bird Sanctuary; and on October 20th, a Paper, "British-Breeding Ducks," by C. S. Meares.

Mr. P. J. Hanson has been elected a member of the Committee, the membership of which now stands at five.

The report of the Bird Sanctuary Committee has been received and is subjoined.

REPORT OF THE BIRD SANCTUARY COMMITTEE.

Mr. A. G. HUBBARD, *Secretary*.

Last year being the first year of the Society's bird sanctuary, the Committee reported at some considerable length, giving an account of the work done in strengthening the fences, fixing nesting boxes, and also enumerating the chief bird observations. In 1914 the work has

been conducted in a similar manner. The nests recorded were somewhat more numerous, the Bullfinch, Wren, Great Spotted Woodpecker and Mistle Thrush being new records. The work of ringing the nestlings has been continued. The interference with nesting boxes by unauthorized persons has been greater.

Probably the most interesting Ornithological records have been:—

1. A Great Spotted Woodpecker enlarging the hole of a nesting box and afterwards nesting in the box.
2. A Tree Sparrow's nest with nine eggs in nesting box.

The Committee regret to report that in November the new owner of Hatch Grove, according to agreement, called upon the Committee to take down the Society's notice boards, remove the gate and re-instate the fence, this has been done, but it is hoped that some new arrangement may be made with the owner for the future.

For the Ornithological Committee,

WILLIAM E. GLEGG, *Secretary.*
November 20th, 1914.

REPORT of BOTANICAL COMMITTEE.

42, Avenue Road, Highgate,
November 13th, 1914.

The Chairman of the Research Section,
London Natural History Society.

Dear Sir,—The work of the past year calls for little comment, seeing that it consists largely of filling up the gaps which exist in the records of the distribution of the plants within the various divisions of our district. None of these call for any special comment. During the year it has been decided to extend the operations of the Society to the south of the Thames, and a Sub-Committee is now considering the question of the definition of the boundaries to be assigned to the divisions of this new area, consistent with the geological features of the district.

The interest in the Herbarium has been maintained, although the additions thereto have materially fallen below the average additions of the past few years.

It is to be hoped that the members of the Society will remember that this department of our work offers ample scope for their activity.

Yours faithfully,

C. S. NICHOLSON.

LEPIDOPTERA RESEARCH COMMITTEE. FIFTEENTH ANNUAL REPORT, 1914.

1. The Committee this year has been re-organised. Its members now consist of Mr. J. E. Gardner, Mr. H. G. Payne, Mr. Louis B. Prout, F.E.S., Mr. R. W. Robbins, Mr. V. Eric Shaw, Mr. Lawrence J. Tremayne, Mr. Harold B. Williams, and Mr. H. Worsley Wood. Mr.

Williams has been appointed Chairman, and Mr. Tremayne has undertaken the duties of Secretary during the present year, but now retires in favour of Mr. Williams.

Following the precedent set by some of the other Committees, the Committee early in the year drew up and adopted the following statement of Aims with regard to its work, which was duly sent in to the President of the Research Section :—

- (a) To study Lepidoptera individually and collectively.
- (b) To promote the study of and interest in Lepidoptera in the Society.
- (c) To do all in our power to protect Lepidoptera in the Society's district, and especially to discourage indiscriminate collecting.
- (d) To make a complete list, with full notes and records, of the species of Lepidoptera found in the Society's district, and to make a special study of the Lepidoptera of such district.

3. Four meetings have been held during the year, and one week-end excursion was taken to Polegate, and was much enjoyed by those members attending, although collecting was only fair.

4. Attention has been given to the necessity for keeping the Lepidoptera interest at the Society's general meetings well to the fore. The Committee have made it their business to provide at least one fixture especially devoted to Lepidoptera on each syllabus, and have also offered to do the same for the local branches. Moreover, all the Lepidopterists on the Society's books have been circularised by the Committee, with a view to keeping up the exhibits at general meetings.

5. A number of other matters have been settled by the Committee which do not find a place in this report. Owing to the work of re-organisation in the first instance, and subsequently to the difficulties occasioned by the war to some of our members, it has not been possible to do a great deal in 1914, but various other projects are in contemplation which it is hoped will mature in 1915.

HAROLD B. WILLIAMS, *Chairman*.

LAWRENCE J. TREMAYNE, *Secretary*.

November 3rd, 1914.

PRESIDENTIAL ADDRESS.

(Read January 5th, 1915, by LOUIS B. PROUT, F.E.S.)

The year which has just closed has been an impossible one to review adequately from the naturalist's point of view. For the past five months we have been cut off from communication with some of the chief centres of activity and the usual sources of our information; and although it may reasonably be assumed that on the Continent even more than at home, that activity has been considerably curtailed, one cannot venture to say that there may not have been important memoirs published or other important happenings. The year's obituary certainly included the name of one very eminent German biologist, Dr. August Weismann; and although we cannot but deplore the fact that the latest we in this country heard of him was as one of the signatories to the very un-scientific manifesto of the German scientists, yet any asperity of feeling should be softened down by the knowledge obtained through his daughter that he was at the time very broken in health and not physically in a condition to take an un-biassed view of a situation in which national antipathies are so deeply involved, and misstatements so widely current. Certain it is that his masterly contributions to our knowledge of histolysis and histogenesis, and his luminous theory of germ-plasm and germinal selection, belong to the world's heritage, and will be studied long after the unfortunate manifesto is buried in oblivion.

Our own country has recently lost two almost life-long workers in the special branch of natural history which most particularly appeals to me—Lepidopterology. With Dr. J. H. Wood, the great authority on Herefordshire Lepidoptera, and an excellent worker at the smaller Microlepidoptera, in which—for example, in *Coleophora* and *Nepticula*—he made some important discoveries, I was not in personal contact, although his name was already a "household word" at the date of my first entry into the entomological community. With Mr. W. Warren, on the other hand—who also commenced writing nearly 40 years ago as an earnest student of the Microlepidoptera, especially of their life-histories—I have for several years been in the closest communication; since 1898 he had been specializing in the *Geometridae*, and in my own earlier studies in this family he was my constant guide, counsellor and friend; to his unfailing courtesy and wide range of knowledge of the subject, I owe more than I can calculate.

To me as a Geometridist—if I may be allowed to coin one of those terms indicative of restricted specialization, which Mr. Godman more than 20 years ago predicted must soon come into use—the year 1914 was further memorable for the appearance of F. N. Pierce's laborious and long-awaited monograph on "The Genitalia of the Geometridæ." The present would not be an appropriate occasion for discussing the many questions of taxonomy, nomenclature, or other matters of purely specialist interest which are suggested by this work, but I shall in

part employ it as a text on which to hang a general discourse upon some of those considerations which arise in my mind when I contemplate such an undertaking as a "presidential address." My chief fear is not that I shall be too specialistic for my audience, but that I shall be too reminiscent of matter to which I have already repeatedly given public utterance; for I cannot forget that I have had the honour to give several such addresses to each of the Societies of which the present one is composed, and that my range of interests of this kind is lamentably restricted.

To say of any memoir—or any branch of research—that the fact of its dealing exclusively with a particular structure in a particular group of organisms, is at once its strength and its weakness, may sound somewhat paradoxical; yet I feel that it is substantially true. It is a mere commonplace nowadays that Nature is *one*, and that there is inevitable loss—an inevitable source of error—in erecting any such artificial barrier as is involved in studying only in one family an organ which has its homologies in many other families, more often than not, perhaps, throughout the animal kingdom, or even throughout organic nature. On the other hand, concentration is an essential condition of successful investigation, and concentration is out of the question unless one consents to occupy a relatively narrow field. I have often thought—and I feel it very strongly in dealing with such a subject as that which is now before us—how very much simpler it would be if Nature had accommodately placed every "family" in a sort of watertight compartment, free of any troublesome leakages from other families. "Much simpler," indeed, but in all probability immeasurably less fascinating; for after all, it is the apparently limitless interrelations and interlacings, the correlations and the complex affinities that give zest to our studies, especially when we betake ourselves to the paths of actual research.

On the old orthodox theory of "Special Creation" such watertight compartments might doubtless have been expected; indeed I, for one, can never quite grasp what authors like Linné—or, to cite a far more modern example, that eminent entomologist John Obadiah Westwood—understood by "relationship" between species or between genera or families, etc. One can only conclude that it was a figure of speech, intended to convey nothing further than the impression of a superficial similarity *analogous* to that observable between blood relations within a single species.

On any or all of the "evolution" theories, on the other hand—unless one can push "Mutation" to an extravagant limit, at which it would almost cease to be an *Evolution* theory—it cannot reasonably be expected that the zoological or botanical entities—whether species, genera, families, or any other grade in classification, shall be either independent or show any uniformity in the degree of their divergences *inter se*. I need scarcely labour this point, which must be sufficiently obvious to those who have given thought to the subject, to say nothing of those who are intimate not only with what should be *ex hypothesi* but with what actually *is* in the organic world. I should hardly have mentioned it at all but that one does occasionally come across good

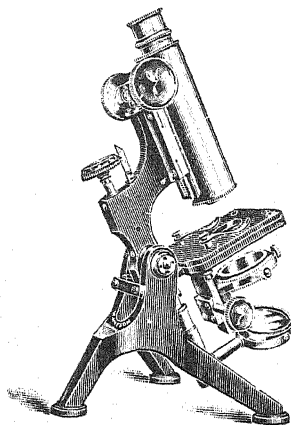
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naturalists who have some pet weakness that they cannot give up. Thus even that leader of lepidopterists, the late J. W. Tutt, who wrote much that was very shrewd and very convincing on the occasional artificiality of our conception "species," yet strangely clung to the view that in some mysterious way a "genus" was a natural grouping, requiring only a sufficiently acute and accurate naturalist to discover it. I have on former occasions confessed to my own bias in the opposite direction—that a "species" is, of the two, more "natural" than a "genus;" but I am willing to confess further, that neither is strictly definable for all cases. I trust I have not worded my thought so badly as to give the impression that we have *never* a right to regard a species or a genus as perfectly sharply differentiated, and, therefore, in a sense "natural." Very far from it; I only mean to affirm that if "species" and "genus" were products of nature they would be found applicable throughout nature's *entire* realm, and that this is not the case. In a nutshell, it is simply a question of the *degree of separation through the extinction of intergrades*. The "missing link," which has been the subject of so much, and often so acrimonious controversy in one position of the zoological series, is certainly discoverable in many positions, and sometimes complicates the question of the validity of species. In other cases it is only reasonable to suppose that intergrades have absolutely died out, sometimes without leaving even fossilized remains to help us complete our chain. We are then justified in speaking of a "very distinct" or "very natural" species. Yet it may still show structural characters enough in common with its nearest ally to fall within the pale of the same "genus" on a taxonomic scheme. But if still more intergrades have died out, leaving the survivors more obviously isolated in structure, the systematist will claim that the differences are "subgeneric" or "generic." Now how any thoughtful person can fail to realize that the degree of divergence that should justify the choice of one of these terms rather than another must remain a question of personal opinion, I am at a loss to comprehend. If we knew every species in the world, living or extinct, and if we had made an exhaustive study of every anatomical and physiological character of every species (sufficiently wild hypotheses, in all conscience!), we might be able to arrive at a consensus of opinion regarding the use that should be made of these characters taxonomically; but even this is by no means certain, and we might well have to fall back upon some arbitrary scheme such as to give a common generic name to each group of a dozen which had the most characters in common.

In spite of this proved artificiality of the "genus," it is, I fear, exceedingly unlikely that we shall be able to escape from its thralldom, and so those of us who essay any systematic work are confronted with the question—On what general principles should it be grounded? After what I have said, you will not expect me to be able to suggest any cut-and-dried scheme, or to assert that absolute consistency is possible, still less to claim such for myself and my own work. As a generalization, I pointed out some years ago (*Trans. City Lond. Ent. Soc.*, xix, 17-20) that genera founded on very small differences were neither historically defensible nor practically convenient, and that our increasing

knowledge of the more detailed relationships within a genus was better met by the erection of sub-genera, or other sectional divisions within a genus, than by creating new and smaller genera. I will not repeat my arguments with the exception of the one which has the most direct bearing on the lines of thought which I am pursuing this evening. Granting that a "genus" is, more or less, a mere *convention*, and that we are therefore unfettered in its precise application; and bearing in mind that the chief feature of the genus is its *name*—for, say what we will, the systematist does, and must, recognise a very large number of grades in relationship, all of which will be equally recognised in good monographic work, but only one of which, other than that of the species, will take part in the "binomial"; with these considerations in view, can we not agree that the application of such names to the smallest groups of allied species is a two-fold evil? In the first place it obviously increases very materially the burden on the memory; the field worker, for instance, is very justly reproved if he talks about having collected "*rubi*," for there are, even in Britain, three Lepidoptera bearing that specific name, to say nothing of other orders of insects, or other classes of animals; it is rightly demanded of him that he shall use the binomial. But if most of our genera are to consist of two species, or one only, as the position taken by some extremists would logically demand, the worker at British Lepidoptera will have to use something from 1,000 to 1,500 generic names, and the worker at the Palearctic Lepidopterous fauna perhaps some 7,000. In the second place a generic name is robbed of a great part of its utility when it is very restricted in application; probably the chief uses that are made of it, other than as a mere additional clue to the species-name with which it is combined, are in general discussions of geographical distribution or of morphology, etc., and it is more than doubtful whether the generic names of such restricted application could convey much information on these subjects. If, for instance, the generic name *Papilio* be allowed the comparatively wide application which is given it in Rothschild and Jordan's revision, we have something which we can utilize in discussions of zoogeography or morphology; but if we have a separate generic name for every pair of species, we can convey far less generalizations through it. Of course the genus-splitters are ready with their reply; they *have* a term for the genus *Papilio* of Rothschild and Jordan—perhaps a tribal or sub-tribal designation, *Papilionidi* or *Papilionici*. This is not to be denied. As I have already indicated, we need many more terms than we possess if we are to show all the recognizable grades of relationship. But my main argument remains untouched; namely, that the convenient course is to use the most concise term for the grouping on which we have to base the most generalizations.

Ideally then, were my knowledge and judgment equal to the task, I would wish to content myself with such a limited number of genera as should not prove an insufferable burden on the memory of the practical worker, and as should at the same time indicate some well-recognized structural deviations and lend themselves to some logical conceptions of geographical distribution. I would not, except after

the most exhaustive study which I could bestow upon it, constitute a single genus of species from the Sandwich Islands and* Greenland, however many characters they possessed in common; the *a priori* evidence against a near phylogenetic relationship in such a case being so overwhelmingly strong. Neither, on the other hand, would I willingly retain in a single genus species which showed marked morphological divergence, even though there might be a possibility that such divergence was of comparatively quite recent date; for this course would vitiate or stultify taxonomic work.

Thus I will not admit that a hard-and-fast system of generic grouping—a dogmatic ruling that this or that structural character is, or is not, of generic value—could be otherwise than a hindrance to the very purposes which are supposed to be served by generic classification. Nor will I admit—and this brings me back more closely to my “text”—that a hard-and-fast system of generic grouping founded on a single character can be acceptable. A generic name, in order to serve its full purpose, should be a sort of shorthand sign for the fullest possible diagnosis, it ought to convey implicitly a yes or no to every question of morphological variability which has yet been studied in the group to which it belongs. Here is the crux of the monographer of a special organ like Mr. Pierce. It is scarcely putting the case too strongly to say that he is betwixt the devil and the deep sea. The rôle of “devil” in the present instance was played by my late friend Mr. Tutt, who, by a criticism on the author’s previous volume on the *Noctuidae*, tried, and not without some success, to beguile him into the slippery paths of reclassification; the gist of Mr. Tutt’s criticism being that Mr. Pierce had discovered numerous hitherto unnoticed indications of affinity and had failed in his duty in that he had not made them clear by any re-grouping of the species. The “deep sea” is personified by the present speaker, who threatens to swallow up Mr. Pierce’s new system in a wider expanse—though far less intensive—of studies in Geometrid structure.

What ought Mr. Pierce to have done? Or to put the question on a broader basis: what ought the investigator to do who is pursuing a special line of research in which he makes discoveries which he believes to be of real taxonomic importance? Two things at any rate we may agree he ought *not* to do. He ought *not* to be discouraged by the difficulty of the existence of such problems, nor by the attacks of carping critics, from pursuing the investigation to its furthest limits; and he ought *not* to conceal, in the hope of conciliating other workers, even the smallest fragment of the results at which he arrives. I have so often spoken and written in advocacy of specialism and of absolute faithfulness to evidence in matters of first-hand research, that I need not labour either of these points, and I have nothing but praise for Mr. Pierce’s new volume in these particulars. There remains simply the question of *method of presentation*. The possible ways of bringing one’s results clearly before the public appear to be: (1) To re-group without really re-classifying; *i.e.*, to show that according to the organ studied such-and-such species are associated, and so on, the species still being called by their current binomial appellations; for instance—to give

one actual case—"Group 26 (of Pierce's Geometridae) consists of *Fidonia carbonaria* and *limbaria*, *Strenia clathrata*, *Thaemonoma vauaria* and *brunneata*, *Macaria liturata*, *notata* and *alternaria*." (2) To re-classify absolutely by the one character, treating each group as a genus and assigning to it the correct generic name. (3) To re-classify by grafting the new system on the latest or best previous one; i.e., where the new results seemed to indicate the division of one recognized genus into two or more, to effect such division, with the needful change in the nomenclature; but where they seemed to indicate the merging of existent differing genera, or of constituents thereof, not to disturb them unless the existent differentiation by other characters could be shown to be inadequate. (4) To graft some remnants of the old system on the new; e.g., in the case of the *Macaria* group, which I have quoted above, to make the whole one "genus," or primary division, but to subdivide it according to the previously used characters.

It is right to say that Mr. Pierce conferred with me on the question of these alternatives, and was not unaware that each had its drawbacks, but felt that the second best suited his purpose and most fully met Mr. Tutt's criticism. The third, which would have been the ideal method, was not considered practicable; it would at least have necessitated either that Mr. Pierce should be a specialist in the *Geometridae* as well as in the genitalia, or that the book should have been brought out under the joint authorship of Pierce and Prout—for which the latter is fain to admit he was not ready. The fourth alternative would have presented nearly the same difficulties as the third, and would only have been, as a sort of compromise, inferior to it. The first course—re-grouping without re-classifying—was approximately that which Mr. Pierce essayed in his volume on the Noctuidæ and for which he was somewhat severely taken to task, but I cannot help thinking he in part missed the main point of the criticism. I cannot believe that Mr. Tutt, or any other experienced systematist, could have wished that each investigator of a single structure should apply an independent system of classification and nomenclature, ignoring the work of other investigators; this would be a negation of the "true specialism" of which Dr. Greenwood in this room has given us so sound a conception (*Rep. North Lond. Nat. Hist. Soc.*, 1911, p. 16): "True specialism, I think, means not to neglect other sciences or subjects, but to make their study ancillary to, and illustrative of, the chosen branch." There is even positive evidence that Mr. Tutt was strongly averse to one-sided classification; not only in the pains which he took, in his own "*magnum opus*," to avail himself of the co-operation of specialists of every kind and grade, but also in his animadversions on Meyrick's really valuable work, which failed only from this very cause—re-classification based on too few characters. I can therefore safely assume that what Mr. Tutt would have wished of any of us who had made taxonomic discoveries through the study of a single organ, is that we should show the re-grouping faithfully and fearlessly and in some form that would render its general results intelligible to the non-specialist; and that it should be left to the few—men of broad

philosophic insight, good general biological knowledge, and reliable mental balance—to correlate these various contributions and work out a re-classification which gave to each its due place. And I am constrained to add that here again it is our binomial system of nomenclature which is the great trouble. But for it, Mr. Pierce could probably have given satisfaction all round; it is the *objects*, and not their names, that interest him and all other morphological workers, and if each single animal had a single name we could shuffle them up again and again and make them into packets, so to speak, according to the progressive results of our researches, just as easily as he and his collaborator, Mr. Burrows, have often done in my presence with their photographic preparations or drawings.

After all, it is pretty clear that this is what will practically have to be done with Mr. Pierce's invaluable book; his *groupings* will be studied, and will in very many cases be found trustworthy and incorporated into systematic entomology; but this could and would have been done quite independently of the system of generic names—although as I am responsible for nearly all the names which Mr. Pierce has used, it is only fair to him and to myself to say that they are as nearly as possible the ones that will be applicable *if we decide that this classification by genitalia alone is to be the accepted one*. Similarly, if another investigator monographs the palpi of the *Geometridae*, I can, from my bibliographical researches, furnish him with the correct generic nomenclature for his groups. But what is the "man in the street" to do if we get a number of these monographs? Must all be divided into small camps, each with its own nomenclature? Must one say "*Macaria*, Meyrick," or "*Macaria*, Pierce," or "*Macaria* "some-one-else" every time one speaks of a genus? Or shall the individual preface his communication or his magazine article with the words "I am a neuractionist," or "a genitalist," or "an antennist"? I leave you to give your own answers.

It has often been on my mind that this chaotic condition of genera in the Lepidoptera, and especially the fact that so many of them are badly or one-sidedly founded, must have an especially disastrous effect on such studies in geographical distribution as those, for instance, in Alfred Russel Wallace's classic "*Island Life*," or the works of Speyer, Koch, Pagenstecher, and other lepidopterists. I would far rather submit to Tutt's over-minute genera than to those which indicate no dependable genetic relationship. I touched on the point a few minutes ago in stating what is my own ideal in generic revision, but I desire to emphasize it. More than once I have had to deal with "genera" which Meyrick says are confined to New Zealand and the Palearctic or to New Zealand and the Holarctic Region, and have found such material divergence in characters, which have been ignored by Meyrick, that I can only conclude their similarity in neuraction and a few other points of structure is due to convergence merely, and that it would be at least very precarious to base any zoogeographical generalisations on the supposed evidence. Examples could be multiplied. Species of *Ourapteryx* and *Abraxas*, for instance, have been described from South America by describers ignorant of structure, and misled merely by

general superficial similarities; a compiler who is not a specialist, however excellent a general zoologist, will more likely than not gather these records and schedule the genera I have named among those common to the Palearctic and Nearctic Regions. The only hope is in the directions which I have reiterated with, I am afraid, almost wearisome insistence—specialism *plus* co-operation. Our compiler's work will, I am convinced, be nearly worthless, at least as regards the *Lepidoptera*, unless he have within his reach a complete staff of specialists to check his labours.

I had intended, in conclusion, to devote a short section of my address to one other aspect of our subject of specialistic studies and their scope; but I have found so much to say on the vexed question of generic groupings that time warns me it must be very brief indeed. I have reserved to the end the quotation of the full title of Mr. Pierce's monograph, which runs: "The Genitalia of the Group Geometridæ of the Lepidoptera of the British Islands." I spoke, in opening, of the fact of any memoirs "dealing exclusively with a particular structure in a particular group of organisms" as "at once its strength and its weakness." It is not in any spirit of carping or of "crying for the moon," that I now add the superimposition of another limitation, the faunistic, is a more obvious source of weakness, only to be borne with on the grounds of dire necessity. When one is dealing with so obviously compact a genetic group as the *Geometridæ*, one suffers far more from ignoring exotic forms than from ignoring homologous structures outside the family. I am so profoundly grateful to Mr. Pierce for the valuable work he has done that I would scarcely venture to mention this at all, but that I know that he, too, feels it. At times I have had the privilege of providing him with extra-British material, which has helped his investigations, and I would willingly have provided and he willingly have utilized much more, but for the inexorable question of practicability. To deal adequately with the genitalia of the *World's Geometridæ*, even so far as they are yet obtainable, would be more than one man's lifework; to prove which I need only tell you that of the "Emerald" sub-family, of which we have eight in Britain, I have catalogued about 1,500, and the number is constantly being augmented. The alternative—to monograph, for instance, the genitalia of the world's Emerald Moths, which would have appealed more to my specialistic ideas, would have been impracticable on account of the enormously reduced appeal of such an undertaking to the British (and European) entomological public. I can only add that both Mr. Pierce and Mr. Purrows are always most kind and helpful whenever I approach them on this matter, and that I hope to live to see at least a few genera of my favourite family dealt with in this exhaustive way.

THE CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

(Read January 6th, 1915, by A. W. MERA).

At the request of some of the members of the North London Society I will endeavour to give a brief sketch of the history of the City of London Entomological Society, which has now become part of our newly-named London Natural History Society.

The Society, which you have now joined hands with, dates back to the year 1858. It then consisted of a small number of Entomologists chiefly residing in the neighbourhood of Haggerston, and was called the Haggerston Entomological Society. I was told by my late friend, Mr. J. A. Clark, that the first meeting place was at the Carpenter's Arms, Queens Road, Dalston, and after a few years the Society removed its meetings to the Brownlow Arms, Dalston, where it continued to thrive for many years. In those early times the Society was sufficiently well-known to attract to its meetings such well-known Entomologists as Doubleday, Stainton, E. Newman, S. Stevens and Dr. Knaggs, and a number of well-known professionals, including Cooke, Ashmead and Meek.

The meetings at the Brownlow Arms must have continued up to somewhere about the year 1888, when the title of the Society was altered from the Haggerston Entomological Society to the City of London Entomological and Natural History Society. I was not a member during the Brownlow Arms period, but I went once as a visitor, and the meetings were held in a large room over the bar. Each member was provided with a long clay; it was customary to call for refreshments from below, and under those soothing influences the science of Entomology was discussed.

After a time, with the advance of the temperance movement, it was thought advisable to sever the connection of science with alcohol, and other rooms were found. This change did not appear to meet with universal approval, as some of the members went off to other societies, but the main body took rooms at the Albion, London Wall. About this time I joined the Society; I should say from memory that it was about the year 1889. At the first meeting that I attended the habit of requiring sustenance during the meetings had not entirely died away, as one of the members present proposed to adjourn the meeting for half-an-hour or so to procure refreshments, much to the annoyance of the president, the late Mr. J. A. Clark. During the year 1891 the meetings were held at 33, Finsbury Square, and it was in that year we first published our yearly Transactions, which have been continued to the present time. At this period our Society took a decided step forward, and it was then that the influence of the late Mr. J. W. Tutt was most noticeable, he being vice-president.

The following year we were fortunate in obtaining rooms at the London Institute, where we had a most commodious and comfortable

meeting place, which we uninterruptedly enjoyed until about two years ago, when the London Institute was taken over by the Government, and from that time our tenure was only monthly. This in some ways created a feeling of uncertainty, and probably added to the falling off of our attendance.

In the autumn of 1895 the late Mr. J. A. Clark retired from the chair in favour of the late Mr. J. W. Tutt, after being president for eight years. Mr. Clark was one of the old school of British Lepidopterists, and he amassed one of the finest collections of his day. His interest in the Society never ceased.

Another member who was always associated in our minds with Mr. Clark was the late Dr. Sequeira. He was one of Mr. Clark's most intimate friends, and the two invariably came to the meetings together. The Doctor survived his friend by some years although he was considerably the older of the two. Unfortunately in the last few years of his life Dr. Sequeira became quite blind, but he never lost his interest in our Society. He was a man of extraordinarily cheerful manner, which never flagged to the last.

For the next three years, 1895-6-7, the chair was held by the late Mr. J. W. Tutt, and every Entomologist knows what weight his name carried. It is hardly necessary to say that under his Presidency the Society flourished, although apparently there was no marked increase in the attendance, as during the years he was Vice-President the Society had already felt his influence, and great progress had been made.

It was generally acknowledged that Tutt in his earlier days had immensely added to the interest in Entomology, which about that time had shown some signs of flagging, but the great interest which he took in the Noctuae and their varieties created a new stimulus in collecting. He was also one of the first to insist on the necessity of having very long series of insects in our cabinets to show local variation. Until that time the very moderate number of six or eight specimens of a species was considered to be sufficient, but with the present wider views, it is very difficult to know where to stop, and the limitation often has to be decided by the amount of cabinet room which our domestic circumstances will permit.

After Mr. Tutt resigned the chair, the Society was favoured by our present distinguished president holding office until the end of 1901, and in 1902 I was elected president, and held the office until our amalgamation. Perhaps the great fault of recent years has been that we have been too much lepidopterous. Although the study of lepidoptera seems almost inexhaustible, largely owing to the vast amount of local variation to be observed, to say nothing of the remarkable increase in the growth of melanism in the British Isles, yet the life histories of so many of our indigenous species have been so thoroughly threshed out that much of the incentive to hard collecting has been removed. Nevertheless the born naturalist still finds keen pleasure in accumulating specimens of great beauty, which will also probably call to mind many pleasant associations.

With our new partnership I fully believe that there will be room

for all true lovers of nature, and our sphere of knowledge will be greatly widened by meeting with specialists in so many other branches of natural history.

As our worthy president is well-known to both Societies I feel confident that nothing will be left undone by him to assure the permanent success of our united Society.

NOTES ON BREEDING AND COLLECTING THE "SESIA."

(Read February 17th, by L. W. NEWMAN, F.E.S.)

When selecting this family for my paper I did so in the hope that my experience might help some of our members who have not taken certain species, to be able to do so in the future.

One naturally connects this sunshine loving family with a hot June or July day, but in order to get a fine series you need not wait for this. Most of my *Sesia* have been collected and bred in November, December, January, and February, so there is no reason to be idle in the winter.

We will first take—

Sesia Ova.—There is still a lot to learn about the ova of this family. Very few have been taken in situ. I have watched *Tipuliformis* ovaposit on the young twigs of red currant. The ova of this family, as far as I have observed, are of a brownish colour and rather flat. In the case where a tree is the food-plant, the ova are usually laid on the bark or twigs, but in the case of *Bembeciformis* (*Crabroniformis*) the ova are laid on the leaf, and in *Apiformis* they are dropped loose at the foot of poplar trees.

The Larvæ.—These are usually of a dirty white colour with a brown head.

The Pupæ.—In colour these run from a light to a rich brown with strong hooks to enable them to climb up the boring—just previous to emerging the pupa shows very distinctly the colour of the Imago.

Ichneumons.—All the *Sesia* larvæ are badly stung as a rule. The ichneumon has a very long ovapositor.

Attacks by Birds.—Some *Sesia* seem exempt from the attacks of birds. I have never seen any sign of *Andreniformis* sticks being touched; other species, notably *Culiciformis*, seem the favourite winter food for the "tits." I have seen stumps of birch almost torn to pieces by their attacks. The cut off stump I have exhibited to-night is a good example. *Bembeciformis* is occasionally attacked; some years ago I knew a willow bed which swarmed with these larvæ, nearly all of which had gone up the sticks some 8 to 10 inches from the stump; I collected a quantity in the winter and there was no sign of attack by birds, but in the early spring when I visited the locality almost every larva had been pecked out. The bird must have been the wood-pecker, I fancy, as some of the stems attacked were as thick as one's wrist, and it must have been a laborious task for the bird to peck right into the centre.

We will now proceed to the methods of collecting larvæ, and although

my notes may help you a little, you will find, as in a great many other things, experience is your best teacher.

Collecting *Sesia Bembeciformis* (*Crabroniformis*).—I have found this species in great profusion in the stems of *Salix caprea*, as many as five or six larvæ in one stem of good size; they also feed in the trunks of various willows, poplars and poplars. The larva makes a cap like *S. andreniformis*, but one seldom finds it with the cap intact, as a rule there is only the hole to guide you. A good plan in searching is to pull at the stems hard, and if there is a larva there the stem usually break away. I have also found them in quite small dead sticks about the size of one's thumb. By far the easiest method is to find a wood where the men are cutting the undergrowth in the winter and to examine the ends of all willow cut, you will then find plenty, as a rule, with a hole in the centre; you can split up the stick to see if your prize is there and then tightly bind up the split end again. Be sure and cut the stick off about eighteen inches long, as very often the larva bores up a good way.

This species sembles very freely if the sun is out from about 9.30 a.m. onwards. The imago emerges from the pupa early in the morning from 7.30 onwards.

***Sesia apiformis*.**—Collecting the larvæ of this species is a mistake as they are very hard to rear if taken in the larval stage. The larva spins a very tough cocoon in the autumn and remains in it all the winter and until it pupates. The cocoon may be found under the bark close to the ground of black poplars; it also sometimes comes out of the tree and pupates in the earth at the foot of the tree, but in any case the results are usually poor if you take the cocoon during the winter—it is best to wait till the larva has pupated. By far the easiest way to obtain this species is to visit the trees about 7 a.m. and take the moths drying their wings on the trunk or grass at the foot of the trees.

It is very easy to see where this insect is common as many trees have a hundred or more old holes just above the level of the ground. A row of trees near my house was almost killed by this species mining round the base and they were cut down. Unfortunately, I did not know *Apiformis* was at Bexley till I saw these trees felled and examined them.

***Sesia sphegiformis*.**—Birch and alder are the foods of this species. It is common, but local, and is very destructive to trees. Whole acres of wood have been known to have been killed by the larvæ; this I believe happened in Wales. The larva is two or three years feeding up. It starts low down entering the young stems at the base after the trees have been cut, and bores right up the centre. The full-fed larvæ may be looked for in about the third years growth of underwood; frass is seen at the base of the stems as a guide.

The larva does not make a conspicuous cap, but it eats all but the thin outer bark away at its emergence hole, and its exit may therefore be found by gently feeling up the stem and pressing with the nail. In collecting, sticks about eighteen inches long should be cut. The imago sembles freely in the sun about mid-day. •

Sesia scoliæformis.—The larva is found in trunks of old birch trees, but occasionally in large branches near trunk. When young it is near surface and its presence is indicated by frass, but when older it works its way into more solid wood about one inch below surface, making a burrow of a fair length running parallel with the surface of the trunk and *away* from the place where it originally began its borings.

When full-fed the larva gnaws its way to the surface of the trunk, leaving only a very thin covering of bark at the mouth of its burrow. It then makes a cocoon of small pieces of wood which is *tough*.

There is a "cap" at the end of this cocoon from which the pupa will force its way when the imago is ready to emerge. This "cap" is not firmly attached to the remainder of the cocoon and would be easily displaced by the pupa. The pupa next breaks away the "cap" of thin bark at the mouth of the burrow and wriggles its way out until about one-third of its length is exposed. The imago shortly after emerges leaving the empty case sticking out of the trunk. You may find these pupa cases any height from ground up to five feet, sometimes as high as nine feet. The imago emerges in the morning from seven to ten o'clock.

Sesia andreniformis.—Until its food plants *Viburnum lantana* and *opulus* were known, this insect was one of our greatest British rareties. It is now to be found almost everywhere where the food plant grows, though ichneumons are fast exterminating it in many localities. I know myself of two hedges over a mile in length with thousands of *Viburnum* bushes in them and hundreds of old borings, but not one of recent years, though no stick has ever been cut there; this will show the devastating influence of the ichneumon.

The larva of *Andreniformis* takes three years to mature. The *1st year* they feed just under the bark only; the *2nd year* they bore into the centre of the stick and feed on the pith going about one inch up the stick. The *3rd year* they enlarge the boring and go higher up. (The total length of the boring is only two and a half inches.) In the late autumn of the 3rd year they come down the boring and make a neat round "cap" just where the baby larva entered the stick. Let me here beg of you not to commit murder when collecting this species, by this I mean do not collect immature larvæ, but only the sticks with a "cap." If you take the larvæ in its earlier stages you will only lose them, as they soon die if out of the growing tree.

There is no special place to look for this species—any dusty old roadside hedge seems as good as nice clean bushes out on the open down. I have even taken them freely in the centre of dense woods where the sun could not reach the bushes, or where the bushes could only get occasional glimpses of the sun.

The ♀ does not select any special part of the tree to deposit on. I have cut sticks with the "cap" one inch above the ground and 14 feet up the tree—some sticks as thin as a pencil others as thick as my arm, so there is really no special place in the tree to search—all you have to do is to use your eyes well.

Birds do not appear to attack this species in the larval stage, possibly on account of the nasty smell of the wood.

S. tipuliformis.—This very common species is well known to most of us, and in June, on a sunny morning, if we look soon after breakfast on our currant bushes we are nearly sure to see freshly emerged specimens sunning themselves on the leaves, and a search of the twigs will show the empty pupæ case protruding. If you want some fun, box some freshly emerged virgin females, place them in a box with a muslin cover over the top and pin up on a currant bush. From about mid-day till 3.30 p.m. males will semble in great numbers; the sun must be bright of course or the males will not fly. I have taken over 100 in this way in a few hours in a currant field not far from my house.

The larvæ are not easy to find, but by a careful search they may be found best by pressing hard the young twigs. Those containing a larva feel soft, as the boring is a long one and weakens the twig a good deal; they also feed in the large stems as well as the young twigs. Tom-tits are very expert in finding the larvæ in my garden.

S. cynipiformis.—To find these larvæ you must first discover a spot where oaks have been felled the previous May; then any time during the winter larvæ may be collected, or pupæ in May and June. Search the old stumps till you see frass between the bark and the wood. When this is found a chisel and mallet only are required. Insert the chisel about two inches below the top of the stump and work upwards, stripping off the bark till you come to the larva in its cocoon. If you work from the top of the stump you are very apt to cut the larvæ.

S. myopiformis.—Larvæ of this species may be found by chipping off the bark of old apple trees; they also feed on hawthorn. The larvæ feed between the bark and wood and do not enter the solid tree. The only sign to go by is the frass.

This insect is extremely local, often only *one* tree in an orchard or garden having any in it. It is usually abundant in its special tree however. I have seen over 100 pupa cases sticking out of an old tree at Bexley and have sembled a great many ♂s from 11 a.m. onwards.

They emerge from the pupæ about 8 a.m.

S. culiciformis.—This is by far the commonest *Sesia* in my district and is doing great damage to our woods; hundreds of stumps which should have thrown up nice undergrowth have been killed.

There are several methods of collecting this larva; they are always found where the birch or alder has been cut the previous winter.

Method I. Cut off with a sharp saw the old stumps as near the ground as possible. This is rather an arduous task, but pays well as a rule, for often thirty or forty may be bred from the one large stump.

Method II. Search all the young growth coming up from old stumps, give each piece a pull and the ones containing a larva will usually break off easily. A good percentage of larvæ leave the stump and bore up the sticks. Examine all dead sticks on the ground round the stump, as often those containing a larva break off with the wind and lay on the ground. There is a boring going up the centre of a stick containing a larva also there is sometimes a "cap" similar to *Andreniformis*.

Method III. With a chisel and mallet start to get the bark off the stumps, work from the bottom upwards. A few larvæ will be found in their cocoons between the bark and solid wood, but most are right in the solid wood and usually near the top of the stump. When you come to a hole going into the solid wood, follow it till you come to the larva. When chipping it out try and get the cocoon intact in a piece of wood. This is not always possible, but often you can splice two chips together containing the cocoon. All loose larvæ should be brought home in saw dust (take a little with you in chip boxes).

S. formiciformis.—This is the clearwing which so far I have not dropped upon successfully in any numbers. I have bred it from a large stump containing *S. bembiciformis* and also found it in small twigs, in both instances in *Salix caprea*. Osiers are its favourite food. It used to be common in an old osier bed at Mitcham, Surrey, but this bed has long been done away with. It appears to make no cap.

S. ichneumoniformis.—This feeds in the roots of *Lotus corniculatus* and may be found by the withered appearance of the crown of the plant. Careful digging will capture the larva and the roots should be planted in damp sand with the crown of the plant on a level with the sand. It is fairly abundant on the Sussex Down, also on some of our Kent hills.

S. philanthiformis.—Usually common where its food (thrift) is abundant, more especially in Ireland, Wales and Cornwall. The larvæ feed in the roots and crown of the plant and cause it to wither. The plant can be dug up and kept moist and the imago easily reared. This species sembles in great numbers about midday.

S. chrysidiformis.—I regret to say that this most beautiful insect is almost exterminated through the over collecting of certain people. Folkestone Warren is its haunt and it feeds in the roots of dock and sorrel. Unfortunately there is hardly any dock to be seen there now. It has all been dug up and taken away in the hope of breeding this fine fly. It may still be found in very small numbers in the roots of sorrel.

The Warren is supposed to be its only locality in Britain, but I am glad to say this is not the case. My friend, Mr. Hills of Folkestone, knows another locality for it, but we hope it may not get well known, so that this fly may breed and multiply and the Warren could then be restocked.

I will now tell you some methods of **breeding** *Sesia* imagines in winter. We will take *Cynipiformis* first. Get a 7 lb. biscuit tin (or a smaller), in the bottom place two or three inches of sand which moisten well, now get a quantity of oak bark, not large pieces, one and a half to two inches square say, and pack these tightly together on the top of the sand; make two or three layers; now all you have to do is to place the larvæ in the tin and they will soon burrow into the bark and make new cocoons. Keep your tin (no lid on it) in a warm place (on a mantelpiece where there is a good fire regularly will do) and don't forget to sprinkle water (warm) over the bark every few days, so that the sand is kept moist, be careful not to drown the larvæ by putting too much

water. Forcing should not be started till after some good hard frost, and not before December.

In a good heat you may look for moths emerging in about 30 days from the time you started to force.

Sesia culiciformis.—Get a flat pan, an old baking tin is what I use, place in this about one inch of damp sand, lay the small pieces of wood containing larvæ on the sand, which damp in the same way as for *cynipiformis*, when your larvæ are in sticks plunge the end of stick in sand leaving emergence hole end standing up. When you have loose larvæ out of cocoons, proceed exactly as in *cynipiformis*, using, of course, small pieces of solid wood and bark of birch instead of oak, emergence will take place from 20 to 30 days after forcing commenced.

S. myopiformis.—Treat in the same way as *cynipiformis*, only use apple bark.

S. bembeciformis, andreniformis, tipuliformis, sphegiformis, formiciformis, all these being in twigs or stems all that is required is to plunge the ends in damp sand.

S. scoliaeformis.—The pupæ being collected in round or square pieces of bark all that is required is to lay these pieces on damp sand, under surface downwards.

S. chrysidiformis, ichneumoniformis, and philanthiformis being in roots of plants require planting in moist earth or sand with the crown of plant well out of soil.

To possess a really good series of each clearwing, if taken by oneself, means plenty of hard though interesting work.

It is a question, too, of great patience and perseverance, and if my listeners will only combine these two qualities and use their eyes, they will most surely be rewarded with some fine series of this very interesting family—the *Sesia*.

BRITISH BREEDING DUCKS.

(Read October 20th, 1914; written by C. S. MEARES.)

1. INTRODUCTORY.

The “*Anatidæ*,” including the British Breeding ducks, upon which I have been privileged to address you this evening, are a family comprising the Geese, Swans and Ducks.

The expression “Duck” is a popular rather than a scientific term, including many sub-families separated by minor structural differences. “Goose” and “Swan” are but other terms embracing similarly distinct sub-families. All these sub-families rank, to all present intents and purposes, equally in the family “*Anatidæ*.”

2. SPECIES.

(a) *Geese*.

Of the Geese there are eight on the British list, of which:—

One only breeds in the British Isles in a wild state, *viz.*, The Grey Lag-Goose.

Five others are tolerably regular winter visitors, *viz.*, White-Fronted Goose; Bean Goose; Pink-footed Goose; Barnacle Goose; and Brent Goose.

The remaining two, *viz.*, Snow Goose and Red-Breasted Goose are very rare wanderers, and as they seldom come within the purview of sportsman or naturalist in the British Isles will be omitted from the scope of this paper.

(b) *Swans.*

All 3 Swans, *viz.*, the Whooper; Bewick's Swan; and the Mute Swan are winter visitors only, although the Whooper used to nest regularly in the Orkneys in the 18th century. In a semi-domesticated state the Mute Swan breeds freely throughout Great Britain, so much so as to cast considerable doubt on any truly wild record which might occur. The Wild Mute Swan, however, lacks the curved neck, and in flight lacks the creaking of the wings of the domesticated species; the neck is nearly straight, and the flight silent.

(c) *Ducks.*

The British Ducks number just over 30, of which 15 regularly remain to breed, *viz.* :—

Sheld-duck	Teal	Scaup
Mallard	Garganey	Eider Duck
Gadwall	Wigeon	Scoter
Shoveler	Pochard	Goosander
Pintail	Tufted Duck	Red-Breasted Merganser.

One of these, the Garganey, is a strictly summer migrant, arriving in March or April, and leaving in September; in consequence it has aptly earned itself the name of "Summer Teal." This species, being the only purely British summer migrant of this family, is worth noting on that score.

One other, the Long-tailed Duck, has once been recorded to have bred in the British Isles. In winter it is of fairly frequent occurrence on our coasts.

Four other species of the Ducks are tolerably common winter visitors, *viz.* :—

White-eyed Pochard (or Ferruginous Duck); Golden-Eye;
Velvet Scoter; and Smew.

The remainder are but rare Winter visitors or occasional wanderers, which also will be omitted from further consideration here.

3. Food.

A requisite closely affecting both the habits and distribution of this family is that of food supply.

(a) *GEESSE.*

All the Geese are mainly and primarily *vegetable* feeders.

The Brent Goose is a *coast*-feeder, eating aquatic grasses and plants, especially those exposed by the sea at low tide on the mudflats and ooze.

The remaining 5—The Grey-Lag, White-fronted, Bean, Pink-footed and Barnacle Geese—feed principally upon grass, clover and vegetable matter which are sought *inland*, the Pink-footed Goose having a distinct partiality for grain, which it seeks on stubble fields. In passing it may be worth emphasising that the Barnacle Goose does not feed on barnacles, as its name might seem to imply.

With the exception of the *Barnacle Goose*, which feeds by *night*, all these geese feed while it is light, whether day-light or moon-light. It is for this reason that the state of the moon is so important a factor in “flight” shooting.

(b) SWANS.

All 3 Swans feed by *day* in fresh or salt waters or ashore, and are entirely *vegetable* feeders.

(c) DUCKS.

In their mode of feeding, the Ducks may be classified into two groups:—

(i.) Surface-feeding Ducks,

(ii.) Diving Ducks,

under which titles Mr. J. G. Millais has recently published a magnificent work in three volumes on this subject.

Of the twenty British Ducks under consideration:—

Eight are Surface-feeding Ducks, all of which are British breeders, and twelve are Diving Ducks.

(i.) *Surface-Feeding Ducks.*

The Sheld-duck, the first of the surface-feeders, is essentially a *coast* dweller and seeks its food by *day*, eating sea-weeds, mussels, molluscs, and crustaceans, which it finds on the shore or on the sands uncovered by the ebbing tide, which it follows assiduously in its retreat.

Six others primarily feed in *fresh waters* or come on land to feed.

(a) Four of these, *viz.*, Mallard, Shoveler, Gadwall and Teal, are essentially *night* feeders, and seek their food *both afloat and ashore*.

The Mallard, Shoveler, and Teal take both vegetable and animal diet, ranging from grain and grasses to insects and worms, in fact eat nearly anything.

The Gadwall is nearly entirely *vegetarian*.

(b) The other two, *viz.*, Pintail and Garganey, seek their food nearly entirely *in the water*.

The Pintail, which eats both aquatic vegetable matter and insects, generally obtained from below the surface, feeds nearly entirely by *day*.

The Garganey feeds on fish and on other small *animal* matter such as water insects and larvæ, and during its sojourn here, which is mainly occupied with breeding operations, feeds by *day* in the morning and evening, as do all of the ducks during the nesting period.

The Wigeon, the last of the surface-feeders, mainly resorts, except in the breeding season, to sheltered *tidal* waters, but the presence of

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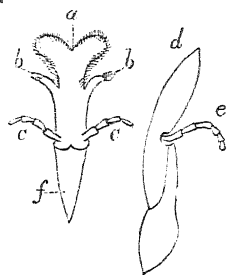
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TONGUE, &c., OF COLLETES
(*Andrenidae*).

(a) Tongue; (b) Paraglossae;
(c) Labial palpi; (d) Maxilla;
(e) Maxillary palpus;
(f) Labium or mentum.

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flocks on inland waters in the sea-board counties is quite a common and usual occurrence. It feeds nearly exclusively on aquatic *vegetable* matter, which it seeks by *day* during the summer months; but as the days shorten on the approach of winter, it still seeks to maintain the hours of its morning and evening meals, and becomes in consequence a *night* feeder.

(ii.) *Diving Ducks.*

Of the twelve Diving Ducks, which obtain their food by diving, eight are British breeders and four Winter Visitors; but before reviewing their feeding habits in greater detail, a characteristic of this class should be carefully noted, *viz.* :—

That all the diving ducks have the hind-toe lobed, *i.e.*, there is a free web on either side of the hind-toe. In the Wigeon this same characteristic is developed in a lesser degree, but it is otherwise absent in the Geese, Swans and surface-feeding Ducks.

Both the wings and feet are used for diving propulsion; some species mainly use the wings, *e.g.*, the Tufted Duck; others the feet, *e.g.*, the Goosander; or in other families the Penguin and the Shag, which may be seen any day at the Zoo; but in cases of fatigue or urgency both wings and feet are simultaneously brought into play. Where the wings are used, ducks seldom expand them as in flight, but keep the tips of the wings pressed to the body, and operate them as it were from the shoulder to the metacarpal joint. The descent is either made diagonally against the current if in flowing waters, or not infrequently in a spiral.

Four of the Diving ducks freely haunt *inland waters* throughout the year, *viz.* :—
 Pochard, Tufted Duck,
 White-eyed Pochard, Goosander,

although they resort to the sea as well.

The Pochard is a *night* feeder, eating mainly aquatic vegetable matter when on inland waters, but when at sea it feeds on crustaceans and molluscs.

The Tufted Duck generally feeds after twilight and before dawn, and includes fish in its mixed vegetable and animal diet.

With the exception of the two species just mentioned, all the diving ducks feed by *day*.

The White-eyed Pochard feeds both on vegetable matter, crustaceans and molluscs.

The Goosander feeds wholly on fish.

Three others, *viz.* :—
 Golden Eye
 Red-breasted Merganser
 Smew

are, excluding the breeding season, mainly sea-feeders, though their occurrence on inland waters is by no means rare.

The Golden-eye feeds largely on marine plants obtained by diving, which it generally brings to the surface to consume; it also eats crustaceans and molluscs.

The Merganser and Smew, like their kindred species the Goosander, feed wholly on fish.

The remaining five diving ducks are, except in the breeding season, exclusively sea-dwellers and *sea-feeders*.

The Longed-tailed duck is a *mid-water* feeder, catching marine insects and other small forms of animal life on which it mainly subsists, supplemented by marine weeds.

The Scaup and Eider are exclusively *sea-bottom* feeders, eating sea-weeds and particularly the smaller shell-fish, to which they are exceedingly partial. The Eider will take fair sized crabs, which it crushes to swallowing proportions in its powerful bill, and full sized mussels, which it is capable of swallowing and digesting whole. The Scaup, unequal to such feats, contents itself with smaller game of a similar type.

The Scoter and Velvet Scoter feed nearly wholly on crustaceans and molluscs.

To recapitulate:—

We have now divided the eight surface-feeding from the twelve diving ducks.

We have seen:—That the Brent Goose and Sheld-duck are exclusively coast-feeders, and five of the diving-ducks exclusively sea-feeders; points having an important bearing on their migrations.

That the Geese, except the Bernacle, the Swans, and the diving-ducks, except the Pochard and the Tufted duck, are day-feeders; and that the surface-feeding ducks are equally divided between day and night feeders; points of considerable importance to wild-fowlers.

That the Geese, Swans, Gadwall and Wigeon are nearly entirely vegetable feeders; and the sub-family *Mergus* entirely fish-eaters.

All the surface-feeding ducks, except the Sheld-duck, are palatable table birds when they have been feeding in fresh water, especially if taking a vegetable diet; but so soon as they are driven to the coast, or the salt water estuaries to feed, their flavour becomes strong and unsavoury. With the exception of the Pochard whilst feeding in fresh waters, all the diving ducks, particularly the sea-ducks, are disagreeable for table.

Before passing on, a structural point of interest is the bill, which differs very considerably in shape and formation in the different species; but a characteristic common to all the species of this family is the lamellation, or plating, of the inside edges of the bill, culminating in the sub-family *Mergus*, which embraces the Goosander, Merganser, and Smew, in a remarkable and ancient type of saw-like teeth, which are set pointing backwards.

The nail, or horny tip to the upper mandible, well exemplified in the Mute Swan, is another odd characteristic represented in this family, but confined to certain species only.

4. RANGE AND DISTRIBUTION.

In range and distribution this family is probably more widely represented than any on the British list, the Shoveler being the most widely distributed.

In several cases where the range of our British species ends, a nearly similar sub-species takes its place, e.g., the Golden-Eye, where a

larger form, identical in plumage, takes its place in N. America, while in the Arctic regions it is represented by the nearly similar Barrow's Golden Eye.

Details as to the known distribution of individual species may be looked up from standard works on the subject, but a brief, if general, analysis of the breeding and winter ranges of various groups of species may help us to better appreciate a review of this family, since general impression is all too apt to regard them one and all as "coming from the North"

(a) All the six British Geese confine their general range to Europe and Asia.

Our British-breeding species, the Grey Lag-Goose, breeds in *Temperate* Europe from Iceland to the Caspian.

The remaining five which are our regular winter visitors, are *Arctic* breeders, choosing between Greenland, Iceland, Novaya Zembyla, Spitsbergen, and the mainland of Europe and Asia around the Arctic Circle, for their breeding haunts.

(b) The three species of Swans grade from Arctic to Temperate.

The Bewick Swan, as a breeding species, is strictly confined to Arctic Asia; in winter it visits most of Europe and temperate Asia.

The Whooper breeds in Iceland, and around the Arctic Circle in Europe and Asia; but not necessarily north of it.

The Mute Swan is entirely *Temperate*, the breeding headquarters lying in S.E. Europe and the Caspian regions, extending to Denmark and the South of Sweden.

In Winter both the Whooper and the Mute visit N. Africa, and all three wander to Eastern Asia.

(c) Of the Ducks—

(i.) Six are Arctic species, *viz.*, the Merganser, and the five Sea-ducks—Scaup, Long-tailed duck, Eider, Scoter, and Velvet Scoter.

The Scaup and Long-tailed duck breed in Northern America, where the Merganser also visits. The remaining three, *viz.*, Eider, Scoter, and Velvet Scoter are represented there by sub-species.

Southward the Merganser regularly visits the Mediterranean and N. Africa; while the five Sea-ducks more sparingly follow the sea-board to the Mediterranean, the Scoter occasionally following the larger rivers.

Eastward the Northern Pacific is reached by the Scaup, Long-tailed duck, and Merganser—the same trio which visit N. America.

(ii.) Seven others breed fairly evenly from South of the Arctic Circle to Mid-Europe, *viz.*, Mallard, Pintail, Teal, Wigeon, Tufted duck, Golden-Eye, and Goosander.

The breeding range of the Mallard extends also to the Mediterranean, N. Africa, and Central Asia.

N. America is visited by the Mallard, Pintail, Teal, and Wigeon though the Tufted duck does not seem to reach so far. The Golden-Eye and Goosander are represented there by sub-species.

Southward all these seven reach N. Africa—the Golden-Eye and Goosander sparingly, the remainder regularly.

Eastward they all range into Central Asia, visiting India and China, and the Pintail, Wigeon and Tufted duck appear to reach Malay.

- (iii.) The remaining seven, *viz.*, Sheld-duck, Gadwall, Shoveler, Garganey, Pochard, White-eyed Pochard, and Smew are *Temperate*, breeding from about latitude 60 to Spain, the Mediterranean and the Caspian regions.

Outside Europe, the breeding range of the Shoveler extends over most of North America, and to North Africa. That of the White-eyed Pochard to Northern Africa and across Central Asia to Turkistan.

The Smew breeds from the Baltic eastward into Asia.

Both the Shoveler and Gadwall visit America and reach as far south as Panama.

Southward all these seven visit N. Africa, and the Shoveler reaches to Cape Colony.

Eastward all seven penetrate to Central Asia, the Garganey to Malay, and the Shoveler to Australia.

5. BREEDING HABITS.

Within the British Isles :—

(a) GESE.

The *Grey Lag-Goose*, which is gregarious, is now confined as a breeding species to Sutherland, Caithness, Ross-shire, and the Outer Hebrides; and there is an introduced colony in Ireland. In bygone ages it used to breed in Lincolnshire.

Somewhat curiously it avoids both the Orkneys and Shetlands, although it breeds in Iceland.

The nest is composed of flags, heather stalks, moss, or any soft material which comes handy in those barren regions, and is rather sparsely lined with "down." It is usually placed in a dry situation on an island in a fresh water loch among such vegetation, dead or alive, as the locality affords, or at the base of some stunted bush.

The eggs, laid from the middle to the latter part of April, generally number four or five, but at least seven are sometimes laid.

The males, during the period of incubation, swim about together on neighbouring waters, and at the approach of danger rise and fly "cackling" over the moors.

In Winter this goose is never very abundant, and prefers the coast lines facing the Atlantic.

(b) GENERAL.

(i.) The "Down."

All the species of this family from the commencement of laying and throughout the period of incubation accumulate a lining to the nest by shedding or plucking the "down" from their breasts, flanks, or chests.

The small fluffy tufts are known as the "down," and at this period of the year are so formed that the small tentacles adhere tenaciously

together when shed ; this is a peculiarity worth noting, since " down " plucked from a duck in winter does not adhere at all. •

The small feathers, which are shed more sparingly and are usually to be found mixed up with the " down " in the nest, are known as the " flank feathers."

At first the " down " is mainly distributed round the rim of the nest, and as it increases in bulk spreads over the cup of the nest, forming a warm lining for the eggs.

In exceptional instances nests have been found entirely devoid of " down," even when incubation was well advanced.

(ii.) *Incubation.*

In all species of this family incubation is undertaken solely by the female, which during this period feeds twice daily, in the morning and evening, usually returning to the nest, though generalities are dangerous, about 9 a.m. and 5 p.m.

(c) DUCKS.

- (i.) The *Sheld-duck* breeds freely all around the British coasts where suitable conditions, such as sand-dunes, exist; sometimes a site is chosen a mile or two inland where the coast is not suitably adapted.

The nest is placed underground, generally in an old rabbit hole, often very deep and several yards from the surface; others, in short burrows, are within easy reach and visible from the entrance. Where ready-made holes are lacking the bird digs its own burrow, which is constructed in the shape of an arc.

Very little material is introduced, just a few grasses and stalks, and the eggs are laid on the dry sand or soil; as incubation advances, " down " accumulates abundantly.

The eggs, laid at the end of April or during the first half of May generally number ten to twelve. To watch the duck return to the nest after feeding is often quite an easy matter, and her nesting burrow may often also be detected by the presence of flecks of " down " around the entrance. During incubation, the males fraternise in the vicinity. The females join them at feeding time on the water's edge, and the males accompany them back to the nests.

When the young are hatched she leads them off to the vicinity of suitable feeding grounds, and must often carry them, presumably on her back, since she often takes them considerable distances over inlets of the sea, or over moorland to the sea.

In winter the numbers are not much augmented, since being a temperate breeder, the migration tends southward from the British Isles.

- (ii.) The *Mallard* is generally distributed throughout the British Isles, and places the nest in a dry situation among grass, heather, or other herbage, according to the locality, often at very considerable distances from any water. Sometimes the nest is placed in the cavity of a tree, such as a pollard willow, and many unusual sites are on record.

Grass, flags, bent and similar material are used in the construction of the nest, to which "down" is freely added. When the nest is left, the eggs are sometimes partially covered with pieces of flags, etc.

The eggs, laid from the middle of March to early April, usually number from nine to eleven. The duck is a very close sitter, and is liable to desert if much disturbed. Throughout incubation the male keeps in touch with the female, joining her when she leaves the nest to feed; afterwards they will often fly round together, dipping as they pass the vicinity of the nest, until the female drops to it.

When the young are hatched, she takes them to sheltered water, where they feed on insects and anything else they can catch.

In winter the number of Mallards is largely augmented by migrants from the North and East. When the weather is severe they leave the frozen inland haunts, and resort to the salt marshes and estuaries.

- (iii.) The *Gadwall*, normally a winter visitor, is confined as a breeding species nearly exclusively to Norfolk and Suffolk, where it was introduced some sixty years ago, and is now tolerably plentiful. A few odd pairs find their way to the Midlands, but they have not been recorded as breeding in Scotland so far as I am aware.

The nest, generally quite close to fresh water, running water preferably, and seldom more than a few hundred yards away, is placed in a dry situation among grass and sedge, sheltered sometimes by trees or a bush; sometimes it is placed under a large tussock or among heather on the open warren.

The materials utilised appear to be those which are most handy; grass, leaves, and pieces of reed when among sedge; pieces of heather when amongst it on the warren; in each case supplemented by "down."

The eggs, generally eight to eleven in number, are laid between mid-April and early May, the nests recorded at the end of May and in June being undoubtedly second attempts. The duck sits very closely, and is apt to desert on the least provocation. A distinguishing feature of both sexes of this duck is the large patch of white on the wings, clearly visible at certain angles when in flight; but when leaving the nest even at the closest quarters, this feature cannot always be clearly detected if the flight happens to be at the wrong angle for observation. During incubation the male remains near by, accompanying the duck at feeding time.

Lovers at all times of seclusion, the young are taken where the water's edge affords plenty of cover.

Even in winter this duck, except around its breeding haunts, is scarce, being a temperate species addicted to more southern migration.

- (iv.) The *Shoveler* shows a great partiality to our eastern coasts, breeding plentifully from the Tay to the Thames, and although it breeds not uncommonly in Ireland, it seems to have no liking for the western sides of Great Britain or Ireland. A few breed in the Midlands, and it has been recorded up to Orkney.

The nesting site is usually in a tussock of grass, which the bird pulls well over the nest so as to completely cover it, on meadow land or marsh, in a dry situation.

The nest is composed of the finer grasses, plentifully lined with "down" in due course

The eggs, laid at the end of April generally number ten or eleven. The duck sits closely and deserts very easily. During the earlier stages of incubation the male accompanies the female at feeding times and drops her again at the nest; but as incubation advances, he leaves her altogether.

In winter the residents are largely augmented by numbers from the northerly brigade of this ubiquitous species, while many of our breeders go southward.

(v.) The *Pintail* is one of our rarer, though regular, British breeding species, and, apart from a small colony on an island in Loch Leven where they have received rigid protection, only a few pairs breed in Scotland, and a few nests have been recorded from Orkney, Shetland and the Outer Hebrides.

The nest, placed in, or under the shelter of a tussock of grass or rushes in some dry situation, is constructed of fine grasses, lined with small pieces of chopped up grass, with the usual complement of "down."

The eggs, usually eight or nine, are laid at the end of April. This duck sits closely, and shows little tendency to forsake her eggs. When disturbed during the advanced stages of incubation, she shuffles off her eggs, splashing them with excrement before leaving, and settles down again within a few hundred yards, repeatedly dipping her head as she watches the intruder. During the period of incubation, the males do not appear to remain in the immediate vicinity.

Regular migrations reach these islands in the autumn, but even in winter this species can hardly be called common.

(vi.) The *Teal* is commonly distributed throughout the British Isles as a breeding species, and places its nest in a dry situation among any sort of thick herbage, which generally forms a complete dome or covering to the nest.

The nest consists of flat grasses, pieces of flags, leaves, etc., or of heather, or other like materials according to surroundings, and is plentifully lined with "down."

The eggs, usually eight to eleven, are laid from mid-April onwards in the South, and in the North early in May. The duck sits very closely, and does not desert easily.

On 26th April, 1914, I witnessed a rather unusual incident:—A Teal, flushed from a nest containing eggs in a very advanced stage of incubation, after feigning broken wings, flew off and perched on a post in a wire fence; from this exalted position she surveyed the prospect for several minutes.

So far as I am aware, the male takes but little interest in the female after incubation has commenced.

In winter their numbers are considerably augmented by migrants, which distribute themselves over most of our freshwater meres. When disturbed they rise at a great pace nearly vertically from the water to a considerable height; and if shot at flying, the whole "wisp" often drop down vertically at lightning speed nearly to the ground before proceeding on their course.

- (vii.) The *Garganey*, which we have noted as being a summer migrant only to the British Isles, is a rare and very local species. It breeds regularly in Norfolk, and has occasionally been recorded to have bred in other counties. To the West of England, Scotland, and Ireland it is only a scarce wanderer.

The nest, placed in a dry situation among marsh-herbage, or in a tussock of grass on meadow land, consists mainly of grasses, lined with "down."

The eggs, usually eight to eleven, are laid in the latter part of April or early May. Nests containing fresh eggs in the latter part of May are probably second attempts. From their arrival up to the commencement of incubation the pair remain together, and sometimes small parties of some three to six may be seen flying round together in early April. So soon as incubation commences the male seems to part company from the female, which exclusively tends the young.

- (viii.) The *Wigeon*, as a breeding species is nearly exclusively confined to the northernmost counties of Scotland; in Sutherlandshire it may be accounted common. The range of this species, however, appears to be extending southward, and nests have been reported from Dumfriesshire, Cumberland, Yorkshire, and Merioneth. No authenticated nest, so far as I am aware, has as yet been recorded from Ireland.

The nest is placed in a dry situation usually amongst heather, the prevailing cover afforded in the North, sometimes on a bank right by the water's edge, sometimes on the moorland slopes, or on an island of a fresh water loch. The materials consist mainly of heather stalks, lined with "down."

The eggs, usually eight or nine, are laid during May, generally towards the latter part of the month. I have taken a clutch of nine on 14th May. The duck sits closely, but is apt to desert if flushed from her eggs. At feeding times the male generally accompanies her.

In the autumn very large numbers of migrants arrive around our coasts, and the return migration takes place about March.

- (ix.) The *Pochard* is a distinctly local breeding species; nests have been found in many counties from Orkney to Kent; but in Ireland, from which nests have been recorded, and in the West of England, it is rare as a breeder. Sociable in its nesting habits, some suitable localities such as are afforded in Norfolk and Essex are tenanted by quite a number of pairs, which flourish under protection.

The situation of the nest differs from that of all other species

under review in that the site is generally damp or wet. The nest, mainly composed of flags, is either a floating structure attached to reeds, or in thick rushes by the water's edge, much resembling the nest of a coot. The amount of "down" seems to vary considerably, but some nests are well supplied.

The eggs, generally ten to twelve, are laid from the end of April onwards, incubation commencing early in May. The duck is a fairly light sitter where nests are placed in open situations. The males keep company with the females even after the young are hatched.

In autumn migrants reach us westward from the Continent, and show a great partiality to returning to their feeding grounds of former years. Their flight is strong and rapid, and they dive splendidly.

- (x.) The *Tufted Duck* breeds fairly commonly in many countries of England, Ireland and Scotland, which offer suitable sheets of water, even within the confines of London; but in Wales and the S.W. counties of England and Ireland it is rare as a breeding species. Many nests are often placed in close proximity, and the species is social in its nesting habits.

The nest, placed in a tuft of grass or among dead rushes in a dry situation, is usually quite close to fresh water, some island on a loch being a favourite site. It is constructed chiefly of grass, with pieces of flag, etc., and well lined with "down."

The eggs, usually nine or ten, are laid in the latter part of May or early June, and during incubation the males remain in the vicinity. After feeding, the duck swims back to the proximity of the nest and walks or flies thence to her eggs.

During winter a considerable number of migrants arrive on our lakes and estuaries.

- (xi.) *Scaup*. The first authentic record of the breeding of the Scaup in the British Isles was a nest with three eggs found by Mr. Heatley Noble, on 14th June, 1899, in Sutherlandshire, which revisited a week later contained a clutch of nine. From 1897 to 1902 Mr. Harvie Brown subsequently recorded a few other nests from the Outer Hebrides. On 11th June, 1906, Mr. Bahr recorded another nest from South Uist with nine eggs, an account of which is given in "British Birds" of December, 1908. One or two nests have subsequently been recorded, but due to its similarity to the Tufted duck the species has probably been overlooked and may be a regular breeding species.

One distinguishing feature of the bird is the white patch on the forehead.

The nest found by Mr. Noble was placed in rushes five feet from the water on an island. That described by Mr. Bahr was also on a small island "situated in a deep hollow some nine inches below the level of the ground, and well guarded by large tufts of grass; a trampled

pathway led up from the edge of the water to the nest." Both the above nests contained a fair quantity of "down."

In winter the Scaup is commonly distributed around our coasts.

- (xii.) The only record of the *Long-tailed Duck* having bred in the British Isles is a nest taken by a lad from Loch Stenness in Orkney, in 1911, when the birds were identified as being on the loch by competent observers. The nest was subsequently identified by the eggs and "down."

In winter this species is common in the North, though adult birds seldom come south of the border.

- (xiii.) The *Eider Duck* nests abundantly in the Orkneys and Shetlands, and at intervals along the East Coast down to the Farne Islands, and breeds fairly commonly on the Inner and Outer Hebrides. The first breeding records for Ireland, where at all times it is rare, were from Donegal in 1912. This species is social, almost gregarious.

The nest, placed in grass or heather, is sometimes sunk and well sheltered, sometimes very exposed, and consists of grass, heather, or other easily gathered material, abundantly supplied with "down." Nests range from close above high-water mark on low lying islands to upwards of a mile inland on the upper slopes of islands at considerable altitudes.

The eggs, usually three or four, and very seldom exceeding five, are laid in the latter part of May. The ducks are tame and fearless, often walking off exposed nests when approached to a safe point of vantage, from which they unconcernedly watch results. Invariably and deliberately before leaving they cover their eggs with excrement, a habit which probably originated as a protective measure against the raids of the larger gulls.

When incubation commences, the males congregate in the nesting vicinity; and at night whole companies will keep up weird "coo-ing" groans.

Even in winter this duck seldom comes much south of its breeding range around our coasts.

- (xiv.) The *Scoter* breeds in moderate numbers in the low lying areas of Sutherland, Caithness, and Ross-shire, and sparingly on the lochs at higher altitudes in Inverness-shire. The first Irish breeding record was the discovery of a nest with eight eggs by Mr. Trevelyan on June 13th, 1905, under a small bush on an island in a fresh water loch, where it has since bred several times. No nest has been recorded from Orkney, or elsewhere in Ireland, though there is some evidence of its having bred in Shetland.

The nest, often well concealed amongst rank heather at some distance from water, and often on an island in a fresh water loch, is composed of grass or heather, lined with "down."

The eggs, usually seven or eight, are laid early in June. When incubation commences the males leave the breeding vicinity.

In winter vast flocks visit the North Sea, the English Channel, and the ocean around the northern parts of Ireland, and a fair number may be observed off the remainder of our coast lines.

- (xv.) The *Goosander* is tolerably common as a breeding species in the northern counties of the mainland of Scotland down to Inverness-shire, but is elsewhere rare.

Any convenient dry hole serves for its nesting purposes; clefts in rocks, especially those overlooking some loch, or forming the side of a ravine; holes in trees; or a hole in a peat bog. The nest is often placed several feet from the entrance where circumstances permit, and the same hole is tenanted year after year. As in the case of the Sheld-duck, flecks of "down" at the entrance, or clinging to the heather which shelters it, lend a clue to discovery.

The nesting materials consist of a few grasses or a little heather, occasionally a few leaves, placed on the dry soil, or sawdust, of the nesting cavity, lined with accumulated "down."

The eggs, ranging from eight to thirteen, are laid early in April. When incubation commences the males separate entirely from the females and return towards the sea. When the young are hatched, she leads or carries them to some neighbouring loch, and takes sole charge of the rearing of her brood.

In winter this species extends its range sparingly southward into England, but in the Orkneys, Shetland, the Hebrides, and Ireland it is at all times rare.

- (xvi.) The *Red-Breasted Merganser* breeds commonly on the inland lochs and along the western sea-board of northern Scotland, in the Orkneys, the Hebrides, and on the lochs and around the coasts of northern Ireland.

The nest is placed well beneath the shelter of thick heather, rushes, or rough grass; in a rabbit hole, or other sheltered cavity in the ground. Island sites are often favoured, and the nest is generally placed in the close proximity of water. The materials are heather, pieces of rush, or grass, according to surroundings, lined with "down."

The eggs, usually nine or ten, are laid at the end of May or early in June. During incubation and after the young are hatched, the male remains in the vicinity of the brood.

In winter this species abandons inland water and betakes itself to the sea and tidal estuaries; around our coasts at this season it is generally distributed.

To recapitulate:

There are in this family four types of nesting site:—

- (i.) That of the burrowing ducks, where the nest is placed underground, often in a hole excavated by the duck. This type is represented by the Sheld-duck.
- (ii.) Those placed in natural holes or cavities in trees, rocks, peat bogs, etc. Of this class the *Goosander* is typical.

(iii.) Floating nests (of the Coot type), represented by the Pochard.

(iv.) Nests in dry open situations on the ground, sheltered to a varying degree by herbage, etc. This is the type of nest adopted by the geese, and the majority of our ducks.

Only two species are *strictly* confined to our coastal areas throughout the breeding season, *viz.*, Sheld-duck and Eider duck.

Eight species of this family breed north of the border only in Great Britain, *viz.* :—

Grey Lag-Goose,	Pintail,	Scaup,	Long-tailed Duck,
Eider,	Scoter,	Goosander,	Merganser,

and the Wigeon very seldom breeds south of it.

Two only are confined as breeding species to the south of the border, *viz.*, Gadwall and Garganey.

6. EGGS, DOWN AND FLANK FEATHERS.

A description of the eggs, "down," and flank-feathers presents considerable difficulties; but in so far as these three factors taken together furnish a nearly unimpeachable identification of the species to which the nest belongs, some attempt at definition, without illustration or exhibit, is excusable, if only on the grounds of inviting progressive criticism.

For preference the eggs, "down," and flank-feathers should be examined by day-light.

The first and only serious effort to deal with this subject was contributed to "British Birds" in two articles, in the June and July numbers of 1908, by Mr. Heatley Noble, entitled "Identification of Ducks' Eggs," supported by excellent full-sized coloured plates of typical flank-feathers of each species. Mr. J. G. Millais in his "Surface-feeding" and "Diving Ducks" pays an eloquent tribute to the accuracy and usefulness of these articles by refraining from further comment on this subject and referring his readers back to "British Birds."

The leading points incident to identification, supported by plates, differ, however, from a full descriptive narrative; and it is with the object of making some small advance in the latter direction that the following remarks will be directed.

The average measurement of the eggs of each species may be found in most standard works. Those of the "down" and flank-feathers where given are taken from specimens in my own collection, the selection being taken at random. The measurements are expressed in inches.

The measurements of the "down" have been taken from the centre quill to the tip; representing the length of the folded flake, or half the diameter.

The measurements of the flank-feathers represent the length from the very end of the quill to the extreme tip. The selection of flank-feathers was made solely from the normal small-type feathers, the occasional larger feathers which are sometimes present being ignored.

(a) *Grey Lag-Goose.**Eggs* :—Dull creamy white.*Down* :—Very light grey-brown, with white centres.

Measurements :—1st nest .9, .8 ; 2nd nest 1.15, .9.

Flank-feathers :—Pure White.

Measurements :—1st nest 1.6, 1.5 ; 2nd nest 1.7, 1.65.

The larger flank-feathers are slate grey, with a slightly burnished band across the top of the feather, tipped by a very narrow margin of white.

(c) (i.) *Sheld-duck.**Eggs* :—Polished creamy white.*Down* :—Nearly white at the bases and tips, and blueish grey in the middle.

Measurements :—1.05, 1.

Flank-feathers :—There are two types :—

1. Pure white, with very dark brown, nearly black, tops.

2. Pure white, with chestnut tops.

Intermediary forms of feathers combining both characteristics are commonly found.

Measurements :—1.5, 1.5.

(ii.) *Mallard.**Eggs* :—There are two main types :—Creamy white tinged with green, and Drab green.*Down* :—Light brown, with large dull white centres, and traces of dull white tips.

Measurements :—1st nest .8, .85 ; 2nd nest .7, .75.

Flank-feathers :—Web and base dull white. The ground colour of the upper portions is brownish grey, tending to burnished brown towards the tips. In the centre of the feather there is a light brown crescent extending *right across* the stem of the feather. Higher up, *well divided from the crescent*, there are two large semi-oval blotches of a rather darker brown, concave at the base, divided by and often meeting at the stem of the feather. Above these and well divided from them (except in the case of some of the larger types of feathers where they meet) a dark brown central marking, with its apex based on the top of the stem of the feather, widens out gradually and extends right to the tip of the feather, where the colour becomes more of a burnished sepia.

Measurements :—1st nest 1.6, 1.5 ; 2nd nest 1.7, 1.6.

(iii.) *Gadwall.**Eggs* :—Buff-white.*Down* :—Very dark brown, almost dull black with rather dusky white centres, and conspicuous dull white tips.

Measurement :—1st nest .9, .9 ; 2nd nest .75, .9.

Flank-feathers :—White, of a slightly sooty appearance,

with rather faint dull brown markings above the centre of the feather. The web of the feather shows traces of brown.

(Mr. Noble's illustration depicts a dark central marking extending from the top of the stem of the feather to the tip—this feature does not appear in the flank-feathers of the nests which I have examined, nor does it appear to be supported by Mr. Noble in his letter-press.)

Measurements:—1st nest 1·5, 1·6; 2nd nest 1·65, 1·3.

(iv.) *Shoveler*.

Eggs:—pale creamy-white, tinged with green.

Down:—Light to medium brown, inclining to grey, with large dull white centres, and small dull white tips—closely resembling in colouration that of the Mallard.

Measurements:—1st nest ·7, ·8; 2nd nest ·6, ·6.

Flank-feathers:—The web of the feather is dull sooty white. The whole of the central portions of the feather are occupied by a large very dark brown horse-shoe, in the centre of which the light stem of the feather shows up clearly. From the margins of the brown horse-shoe outwards the sides and uppermost portions of the feather are of a burnished brown, the extreme tips sometimes shading off to a silvery white.

(The illustrations given by Mr. Noble are far from typical of the feathers in my collection.)

Measurements:—1st nest 1·15, 1; 2nd nest 1·15, 1·1.

(v.) *Pintail*.

Eggs:—There are two types, a light cream-green, and a light cream-brown.

Down:—Medium brown, very faintly tipped with white. Fairly large white, to dull white, centres.

Measurements:—1st nest ·8, ·75; 2nd nest ·85, ·9.

Flank-feathers:—Web dull brownish-white. Just below the middle of the feather there is a brown central marking extending across the stem of the feather, sometimes taking the form of a horse-shoe; this marking is in some feathers quite large and well defined, though in others it is hardly traceable. The dull white ground colour of the feather forms a band or horse-shoe above this lower marking. Higher still about two-thirds up the feather, a very broad band varying from dark to medium brown with a tendency to burnished margins extends nearly across the upper middle portions of the feather, while a similar but narrower brown band is thrown up from the centre of the cross band right to the tip of the feather, though the extremity of the tip sometimes shades off to dullish white. The two top angles of the feather (above the brown cross band and on either side of the upright

band) are white, sometimes a conspicuous silvery white, sometimes dull white.

Measurements:—1st nest 1·2, 1·2; 2nd nest 1·8, 1·25.

(vi.) *Teal*.

Eggs:—Creamy white, with a tinge of green.

Down:—Nearly black, with prominent silvery white centres, but no white tips.

Measurements:—1st nest ·7, ·7; 2nd nest ·75, ·65.

Flank-feathers:—The web and general ground colour of the feather are smoke-grey, dulled by faint traces of brown. The markings are of a medium brown, and fall into three groupings:—

- (1) A band, or horse-shoe formation, across the upper middle portions of the feather, throwing up another central band towards, but not extending to, the tip.
- (2) Two broad bands running up the centre of each side of the feather, parallel to the stem of the feather, but not reaching to the tips.
- (3) An elongated inverted horse-shoe; the result of the two parallel bands above mentioned meeting towards the top.

Measurements:—1st nest 1·0, 1·1; 2nd nest 1·2, 1·1.

vii.) *Garganey*.

Eggs:—Creamy white, without any trace of green.

Down:—Nearly black, with white centres, and very conspicuous white tips.

Flank-feathers:—Base, dull brownish white. The ground colour of the feather is greyish-white, with a conspicuous semi-oval large brown marking in the centre of the feather.

viii.) *Wigeon*.

Eggs:—Cream white, with a faint to a pronounced tinge of buff.

Down:—Medium to dark brown, with small dull-white centres, and narrowly tipped with white.

This down is very similar to that of the Gadwall, but lacks all tendency to black.

Measurements:—1st nest ·8, ·85; 2nd nest ·9, ·8.

Flank-feathers:—There are two types:—

1. Pearl-grey to white; entirely lacking the dull brown central markings generally present in the Gadwall.
2. Feathers with the web, bases and the upper central portions light brown, bounded by a darker brown arc across and above the middle of the feather. The upper portions and margins of the feather above this arc are pure white.

(This type of feather occurs freely in one of the nests in my collection, but is entirely absent from the

other nest; it is neither described nor illustrated by Mr. Noble.)

Measurements:—

1. White feathers: 1st nest 1·3, 1·3; 2nd nest 1·3, 1·3.
2. Brown feathers: 1st nest none; 2nd nest 1, 1·1.

(ix.) *Pochard*.

Eggs:—Drab-green.

Down:—Dull sooty-colour, with small and very dull white centres, and no white tips.

Measurements:—·75, ·7.

Flank-feathers:—Web and lower portions of the feather smoke-grey, shading to a darker dull brown towards the tips.

Measurements:—1·1, 1·05.

(x.) *Tufted Duck*.

Eggs:—Creamy buff-green.

Down:—Very dark sepia-brown, but by no means black, with small brownish-white centres and no white tips.

Measurements:—1st nest ·75, ·7; 2nd nest ·9, ·8.

Flank-feathers:—There are three types:

1. Silver-grey.
2. Sepia-brown all over, nearly the same colour as the “down”; rather darker at the tips than at the base and centre.
3. Sepia-brown feathers, with conspicuous white tips, or traces of white tips. These feathers come from the chest of the duck.

Measurements:—

1. Silver-grey Feathers:—1st nest 1·25, 1·2; 2nd nest 1·2, 1·25.
2. & 3. Sepia-brown Feathers:—1st nest 1·05, 1·15; 2nd nest ·9, ·9.

(xi.-xii.) The eggs, “down” and flank feathers of the *Scaup* and *Long-tailed Duck* I have had no opportunity of examining at close quarters.

(xiii.) *Eider Duck*.

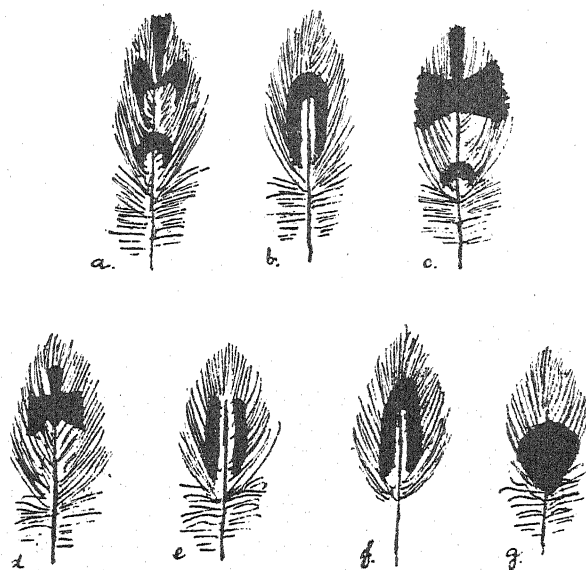
Eggs:—There are two types, Olive-green, and creamy-grey with a tinge of green.

Down:—Dull smoke-brown, with small pure white to brownish white centres.

Measurements:—1st nest 1, ·8, ·85; 2nd nest ·9, ·9, ·6.

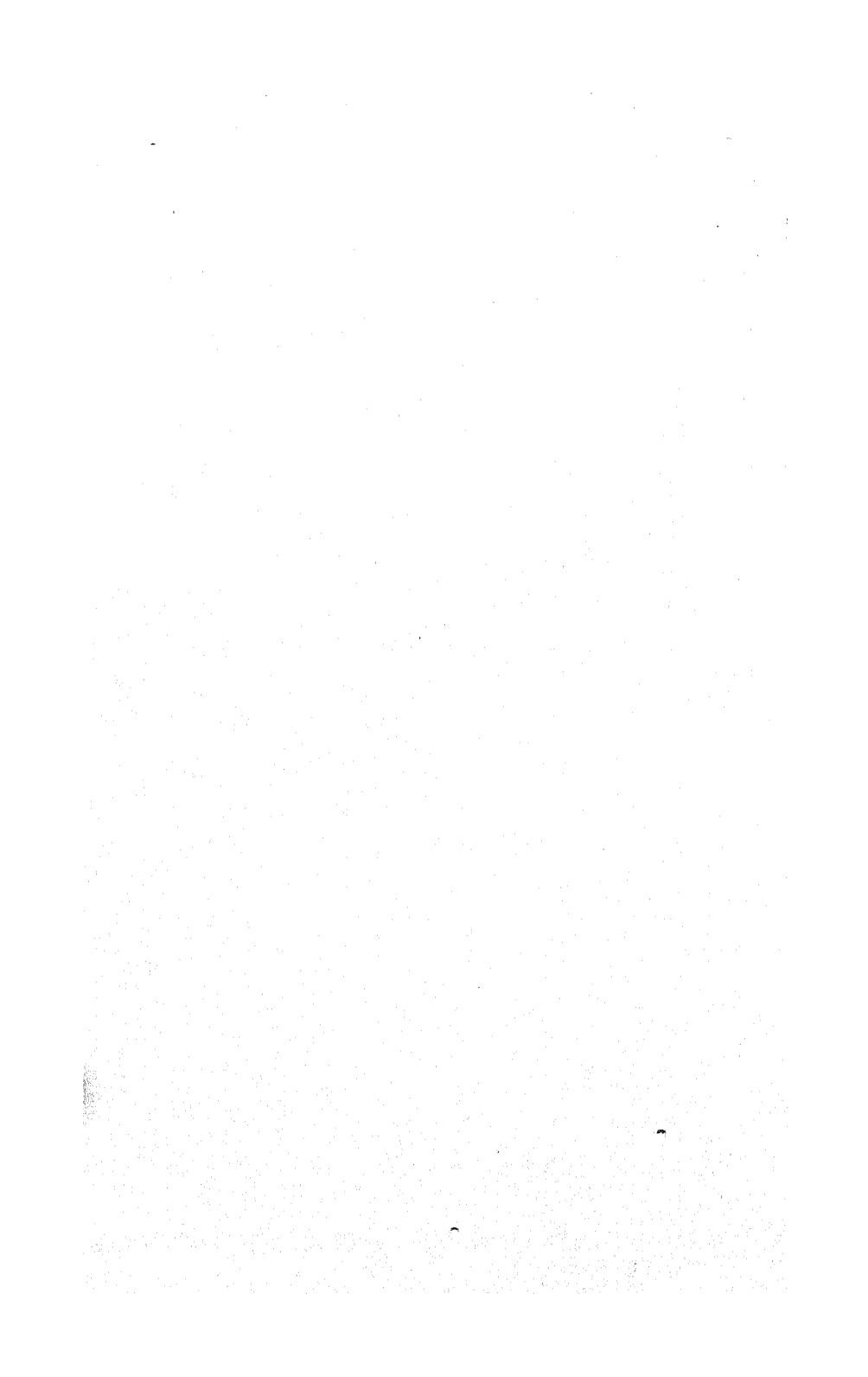
Flank-feathers:—Dull smoke-brown, darkening towards the tips, and sometimes broadly tipped with very dark brown. In the larger flank feathers the upper portions have a burnished brown ground colour, and are barred with black; the lower portions of the feather fade away into smoke-brown.

Measurements:—1st nest 1·15, 1·35, 1·2;
2nd nest 1·35, 1·35, 1·4.



FLANK FEATHERS.

a, Mallard; b, Shoveler; c, Pintail; d, Teal (1); e, Teal (2);
f, Teal (3); g, Wigeon.



(xiv.) *Scoter.**Eggs* :—Buff-white.*Down* :—Very dark brown, nearly black.*Flank-feathers* :—Smoke-brown, fairly light at the base, and darkening considerably towards the tip.(xv.) *Goosander.**Eggs* :—Yellowish buff.*Down* :—Light pearl-grey; very much whiter than the down of the Sheld-duck.*Measurements* :—9, 1.*Flank-feathers* :—White generally tinged with traces of yellow. Sometimes there are small but well defined dark brown markings adjacent to the stem of the feather.*Measurements* :—1.75, 1.65.(xvi.) *Red-Breasted Merganser.**Eggs* :—Drab-green.*Down* :—Drab-grey.*Flank-feathers* :—White.

THE MIDDLE AGES IN THE WEY VALLEY.

(Read by E. CHAPMAN, on November 3rd, 1914.)

To-day, when Europe is aflame with a terrible war, the Middle Ages seem indeed a long way off, yet, in the war two deeds, the destruction of Louvain and the bombardment of Rheims Cathedral, have specially shocked civilised people largely because the Flemish city and the great French church were alike beautiful survivals from those times.

Since Gibbon wrote his wonderful survey, each generation has turned with increasing interest to the great stretch of the life of Europe which lies between the Fall of Rome and the Fall of Constantinople, to the period in the life of our own nation which lies between the coming of the monks under St. Augustine of Canterbury and the Dissolution of the Monasteries under Henry VIII. Gibbon saw in all this the decay and destruction of the stately Roman order that he esteemed. "I have described," he said, "the triumph of barbarism and religion." To-day we look with other eyes. We regard those ages, with differences of course, among ourselves, but with very different feelings from his. Where he saw the ruin of an Empire we see the rise of the nations, their slow transformation from wandering hordes into great civilised communities. For us, among the outstanding features of the Middle Ages are the rise and decay of monasticism, the long struggle between the Church and the State, the struggle between the Crown and the Nobles, with the accompanying rise of the middle class, the rise and triumph of a new architecture, a glorious art bringing the other arts in its train, the birth of democratic ideas, the beginnings of modern industry, of modern education, and of modern literature.

All these were broad movements common to every country of mediæval Europe. In this paper I should like to trace their effects, as they are illustrated in one little valley which has been my home for the last twenty years, the valley of the Wey, in Surrey.

Of the half dozen towns and some two score villages existing to-day in this area, nearly every one has grown up round a site chosen in the centuries before the Norman Conquest. They bear, so far as their etymology can be surely traced, English, and not Celtic or Roman names. Some, as Tuesley, Wanborough and Thursley, recall the gods worshipped by the first English settlers. But we have no light on the change from Pagan to Christian worship. In the tangled struggle for overlordship among the English chieftains, Surrey seems to have thrown off the rule of Kent in a battle at Wibbandune, a place which cannot now be identified with certainty. Then Mercia held sway here, and the county derives its name from this fact. It was the South Rey or kingdom—that part of Mercia which lay south of the Thames. Wulfhere, the second Mercian king from the great Pagan leader Penda, founded, or is said to have founded, Chertsey Abbey in 666. That is the first notice we have of any Christian foundation in the county. The dominion of Wessex succeeded, and brought Surrey, with so much else, into the common rule of the King of England.

The fact that Winchester was the first national capital, had its importance for our valley, which lay on the road between Winchester and the great Mercian city that in the end was to supersede it as metropolis. The king and his bishop each had their stronghold at important points in the valley, and when, later, the two Norman castles of Guildford and Farnham, whose remains we see to-day, superseded these strongholds, the fact that they were held by the king, and the bishop who was all through so emphatically the king's bishop, preserved the valley in comparative peace and security. Only once, for a few days at the end of John's reign, did both castles pass into alien hands.

The Norman Conquest strengthened and crystallised the manorial system, which, here as elsewhere, had already grown up. The soil was for the most part poor, and very many of the manors had great wastes that were never brought into cultivation, a fact to which the district owes those commons which make it to-day so attractive to the Rambler and the naturalist.

The king himself held many of the manors in his own hands. One of them, Pyrford, formed, with Battersea, the price he paid to the Westminster monks for their lands at Windsor. A result of this acquisition was that a large part of West Surrey was declared to be in the royal forest of Windsor, and was ruled for centuries under the forest laws. Questions of jurisdiction arose, and the afforested area was at length defined as all Surrey north of the road over the Hogsbuck and west of the Wey. In the extreme south-east of this area the king had his park at Guildford, and, further north at Woking, a manor house, which, under the last Henry, became a frequent royal residence.

The valley was so strongly held, and was so largely royal demesne, that the long struggle between Crown and Nobles left little mark upon it, but with the rise and decline of monasticism, and with the struggle between the church and state its history is closely linked. The documentary history of Surrey begins with a charter, probably a forgery, but a very early one, of Chertsey Abbey. The great monastic revival of the eleventh and twelfth centuries saw the reform of the Benedictine rule, and the foundation under an Englishman, Stephen Harding, of the Cistercian order. In 1128 the Bishop of Winchester brought over from France twelve monks of the new order, and gave them lands at Waverley by Farnham, where, under the renewed encouragement of successive bishops, they established a great abbey. The story of this abbey forms in itself a synopsis of the story of monasticism in England. We see the monks busy with their buildings, industriously cultivating the country side, raising great flocks of sheep on the neighbouring hills, entertaining great nobles and kings, for here in 1208 came John to spend four days of Holy Week, bringing with him two tons of wine, no doubt to mitigate the severity of the Lenten fast, and here, in 1225, came the young Henry III., and was admitted to the confraternity in the chapter house. At this date the monks were in the midst of rebuilding; they were replacing their first Norman Abbey with a beautiful Early English structure. The new church was

completed in 1230, and now the monks seemed at the height of their prosperity. In 1240, a young shoemaker charged with homicide took sanctuary with them, but after some months, was seized by the king's orders, and carried off to prison. The Abbot after a vain appeal to the Papal Legate, turned to the king himself, producing the charters and privileges of his order, convincing him "that the precincts of Abbeys and their Estates were by apostolical authority exempted from the encroachments of all wicked and profane persons, and inviolable as the altars of churches." The shoemaker was restored to the monks, the officers who arrested him were condemned to ask pardon at the convent gates, and afterwards to be publicly whipped, "which sentence having been fully executed upon them by the Dean of the House and the Vicar of Farnham, they were absolved in form, and, having a sufficient penance enjoined them, were dismissed."

Nor was this the only incident in the great struggle which the valley witnessed. Already in July, 1174, Henry II. had passed through Guildford on his swift penitential journey to Canterbury, after the murder of Becket, and in 1199, Ruald de Calva had founded, in honour of St. Thomas, the Austin priory of Newark at Ripley. The beautiful little church of East Clandon also dates from about this time and bears the same dedication.

Of the rise and development of mediæval architecture, the valley presents many interesting, but no very rich or famous illustrations. The district was not wealthy, and building materials were not of the best. But what a rural population could do with flint and chalk and Bargate stone, with tiles and Horsham slabs, and with here and there a shaft of Sussex marble, was done. Of the ancient churches the outer walls are mostly of flint, and the interior arcades very frequently of clunch—a hard form of chalk. Lofty towers and delicate traceries were alike out of the question. But of simple and sincere work, well adapted to its ends, much is left to us.

Of Pre-Conquest building there is little remaining, but the strong rude towers of St. Mary's, Guildford, and of Compton have been ascribed to this period with some confidence. Of the Norman period there are several interesting examples, including Compton with its unique chapel above the vaulted sanctuary, and its very ancient screen, the main structure of St. Mary's, Guildford, whose walls were enriched in the thirteenth century by paintings which remain, the royal keep of Guildford, and the tiny village church of Pyrford. Of Early English work the most notable remains are those of Waverley Abbey, the beautiful western doorway of Shere, and the great E. window of seven lights at Ockham. The architectural needs of the district do not seem to have undergone any great expansion in the fourteenth century. Here and there a fine new window was opened, as at Shere, but I do not recall any building wholly in Decorated work, and similarly the examples of Perpendicular work are mostly to be found in enlargements and modifications of older buildings. Then at the very close of our period, we see the needs of a new time finding satisfaction in two buildings, both instinct with the old Gothic beauty, the great manor house of Sutton, and the Grammar School at Guildford.

Throughout the mediæval period, the district depended for its economic life almost entirely on agricultural and pastoral activities. We have not much evidence for tracing the slow change from the old system of communal cultivation to the system of separate farms, but in the Lammas Lands at Godalming and the Broad Meads at Woking there are survivals of common pasturage. The stocks of wool raised by Waverley monks from their great flocks were no doubt a factor in the creation in the thirteenth century of a cloth industry at Guildford. For a time, Guildford cloth had a good reputation in the markets of Europe, but it is recorded that the reputation was lost by the greed of the clothmakers, who so stretched the cloth to increase its quantity, that the quality was injured. The meadow, where the cloth passed through this finishing process, still bears the significant name of Racks Close.

Another manufacture, which, like that of cloth, has passed away from southern England was that of iron. At Thursley and Abinger there were works for smelting the rough ironstone of the Greensand formation, but these were only outliers of the Sussex ironworks, and did not survive the general substitution of coal for wood in the furnaces. The ponds at Thursley, formed to provide the water power for the smelters' hammers, are still the Hammer Ponds.

Side by side with these industrial developments there had arisen in the little towns of the valley, as elsewhere, a desire on the part of the burgesses for some measure of freedom from their feudal lords. The thirteenth century, which saw such great constitutional developments in our national life, brought to Farnham and Guildford their first recorded charters. In 1247 the Bishop of Winchester gave to the burgesses of Farnham the whole manorial authority in the borough and town, reserving to himself the privileges of hue and cry, persons and chattels of felons, escheats of their lands and tenements, and the services of two or three of his chief tenants. In 1257 Henry III. gave to the "approved men" of Guildford freedom from arrest for debt as sureties, unless they had clearly not done their best, freedom from forfeiture of chattels for defaults of their servants, and the right of heirs of intestates to their chattels. Such were the simple beginnings of municipal liberties. In the next century a far broader claim for freedom arose from the industrial population of south-eastern England stirred by John Ball and his fellows. Their so-called Peasants' Revolt in 1381 seems to have been more truly a revolt of the craftsmen of the towns. The constable of Guildford Castle, Sir Simon Burley, played a prominent part in the events which precipitated the outbreak. The arrest of one of his serfs, who had taken refuge in Gravesend, brought the angry townsfolk in full cry about the walls of Rochester Castle whither he had carried his man. Either during his absence or soon after his return, the Guildford populace rose against their lords, including apparently the "approved men," and held all the town outside the castle at their mercy. They destroyed the borough charters, following in this the example of their Kentish friends, for the rebels seem everywhere to have believed that it was by these charters and like

documents that their lords exacted their services. Thus it happens that the earliest muniments of Guildford are only copies of the 13th century charters, copies obtained from the crown after the ruthless suppression of the democratic movement.

With the rise of these new forces, monasticism entered on its final decay. In 1387, William of Wykeham visited the Priory of Austin Canons at Selborne, and severely admonished the convent for its worldliness, threatening it with dissolution. The abundant wild life of that lovely district among the head-waters of our stream, seems to have proved too strong a distraction for the holy men. That a Selborne cleric of a later day also felt its secular fascination is the joy of this and every Natural History Society. But in 1486 William's threat was followed by a papal bull dissolving the convent. So Selborne Priory was the first to go of the religious houses in the valley. For all of them the end was near. We spoke just now of Waverley in the days of its glory, when kings were its guests, and their servants did penance at its gates. How the world had changed when in June, 1536, this letter was handed to Thomas Cromwell :—

“To the right honourable Master Secretary to the King :

“Pleaseth your mastership, I received your letters of the 7th day of this present month, and hath endeavoured myself to accomplish the contents of them, and have sent your mastership the true extent, value, and account of our said monastery. Beseeching your good mastership for the love of Christ's passion to help to the preservation of this poor monastery, that we your beadsmen may remain in the service of God with the meanest living that any poor man may live with in this world. So to continue in the service of Almighty Jesus, and to pray for the estate of our prince and your mastership. In no vain hope I write this to your mastership for as much as you put me in such boldness full gently when I was in suit to you the last year at Winchester, saying ‘Repair to me for such business as ye shall have from time to time.’ Therefore instantly praying you, and my poor brethen with weeping, yes ! desire you to help them ; in this world no creatures in more trouble. And so we remain depending upon the comfort that shall come to us from you, serving God daily at Waverley.

“From thence the 9th day of June, 1536.

“William, the poor abbot there, your chaplain to command.”

Alas for the weeping monks ! no comfort was to come to them from Thomas Cromwell. At St. Nicholas Rectory, in Guildford, he was next year signing the deeds of dissolution of all the smaller houses. In 1538 the Black Friars of Guildford, the only religious house remaining in the Valley, made their surrender. Outside, the free scholars of Robert Beccingham's foundation were playing on the broad slopes of the Town Ditch. The Middle Ages had passed away.

GYNANDROMORPHISM.

(Read December 1st, 1914, by E. A. COCKAYNE, M.A., D.M., M.R.C.P., F.E.S.)

Insects half male, half female have been known from an early period and on account of the great degree of sexual dimorphism in many of the Lepidoptera are especially conspicuous in this order. The term gynandromorphous or gynandrous was applied to them without regard to their internal anatomy. Indeed, the first dissection was not carried out until Rudolphi examined a halved specimen of *Gastropacha quercifolia* in 1825. Westwood drew attention to the less noticeable forms of gynandromorphism in his "Thesaurus Entomologicus Oxoniensis."

Ochsenheimer divided them into perfect and imperfect, and Lacordaire further subdivided them into

- (1) Semilatéral (halved).
- (2) Superposé.
- (3) Croisé.

In addition he pointed out that in all three forms the sexual elements may be in equilibrium, but in the last two one or other sex may predominate to any extent.

A very elaborate classification was carried out by Dalla Torre and Friese but is most unsatisfactory. Many of their groups are void of examples and the great majority fall into two groups only.

The internal structures are very variable and classification based on them is not entirely satisfactory.

I have suggested the following arrangement:—

I. Genetic Hermaphrodites.

Primary sex glands of both sexes present.

- (a) *Unilateral.* Ovary or testis on one side
Ovary and testis on the other.
- (b) *Bilateral.* Ovary and testis on both sides
or ovarian and testicular tissue in the same
gland on both sides (Zwitter drüse).
- (c) *Lateral.* Ovary or ovaries on one side
testis or testes on the other.

II. Primary Somatic Hermaphrodites.

Sex gland or glands of one sex only, but parts of secondary sexual apparatus of both sexes present.

- (a) Male type, one or two testes.
- (b) Female type, one or two ovaries.

The gland or glands in both these groups may be perfectly developed, but a more or less rudimentary condition is common in the case of the ovary.

III. Secondary Somatic Hermaphrodites.

Sex glands of one sex only and secondary sexual apparatus of one sex only corresponding to the sex gland present. Secondary sexual characters of both sexes present in antennae, wings or other part of body.

(a) Male type. Two testes.

(b) Female type. Two ovaries.

The majority of gynandromorphous insects fall into group II., and relatively few into groups I. and III. Probably groups I. and II. are much more closely related than group III. Nearly all genetic hermaphrodites are lateral, and usually have one ovary and one testis, but both two sex glands of one sex may be present with one of the other sex, or two of both sexes may be present.

The Secondary Sexual Apparatus.

Very frequently where a sex gland or secondary sexual apparatus of one sex is present, a portion of that belonging to the other sex is also found. Usually only the lowest part of the tract is found in such cases, but sometimes the whole is present, though of course, in group II., without the sex gland itself. And in the external genitalia there may be a similar arrangement: a complete set of both male and female organs may lie side by side. In other cases the internal organs and external genitalia may be half male half female without any doubling, in others the organs may be almost or even wholly of one sex. Even in lateral genetic hermaphrodites the lower part of the genital tract of one sex may be absent, whilst that of the other may be wholly or in part doubled.

In all cases deficiency of internal or external structures is very common.

Occasionally a mosaic replaces the halved arrangement. Perfect halving is seldom carried to the external genitalia and only one example, that of Toyama's *Bombyx mori*, is known in which it has extended to the whole of the internal and external organs. The appearances presented suggest that one half of the genital tract can give rise to a complete genital apparatus, so that, if one half of it is male and the other female, a complete double set of organs of both sexes is present including the sex glands themselves. Usually one side develops better than the other and often neither develops perfectly. On this view most primary somatic hermaphrodites and all lateral genetic hermaphrodites are of the same nature. Unilateral genetic hermaphrodites are more probably produced by a mosaic arrangement of the cells of the germinal epithelium and primitive genital tract, but they are extremely rare.

Gynandromorphism in Vertebrata.

Gynandromorphism has occurred in all the better known orders of Insects, Lepidoptera, Coleoptera, Hymenoptera, Diptera and Orthoptera and in various crustaceans and spiders. In addition it has been met with in birds, but only five examples are known. In four of them the halved arrangement was perfect externally and internally. They were lateral genetic hermaphrodites with a testis on the male and an ovary on the female side. The fifth a pheasant was similar except for some decussation of sex characters in the tail. In mammalia I know of no instances except four doubtful ones in man. The famous Karl or Katherina Hoffmann was probably a lateral genetic

hermaphrodite and undoubtedly showed some segregation of the secondary sexual characters of the two sexes, both physical and psychical, to the opposite halves of the body.

Garrigues states that he met with a perfect example in 1896 in America, but gives no detailed description or photograph.

The perfection of the halving in birds and in the lobster reported by Nicholls is of the utmost importance in considering the cause of the condition.

Gynandromorphism and Heterochroism.

In addition to a segregation of sex characters some insects show a segregation of somatic characters, colour or pattern, quite independent of sex. Some of these are halved and some show a coarse mosaic arrangement. In many cases one of these colours or patterns is a simple Mendelian dominant to the other. Examples of this are *Psilura monacha*, part type, part ab. *eremita*, *Hemerophila abruptaria*, part type, part var. *brunneata*, *Agria tau*, part type, part var. *lugens*, and *Acidalia virgularia*, part type, part ab. *bischoffaria*. In all these and the many others known the parts showing type colour were of one sex, the parts showing varietal or aberrational colour the other. Larvæ of *Bombyx mori* have been met with showing melanic colour on the one half of the body and typical pale colour on the other. Where these have reached maturity the imago has proved to be a halved gynandromorph. One example showed a mosaic arrangement of the two colours but no moth was bred. Here again the melanic colour is a simple dominant to the type.

Heterochroism.

Quite a number of examples of insects are known in which halving or mosaic arrangement of type and aberrational colour has occurred without any gynandromorphism. Such are specimens of *Chelonia caia*, half type, half melanic, of *Agria tau*, half type, half var. *lugens*, of *Acidalia virgularia*, half type, half ab. *bischoffaria*, of males and a female of *Psilura monacha* showing a mosaic of the colouring of the type and the ab. *eremita*, and of *Tephrosia crepuscularia* (*biundularia*) with a mosaic of the type colour and that of the ab. *delamerensis*.

Gynandromorphism with typical and sex-limited colour.

Many instances are known in which the female portion (half the insect or irregularly distributed areas) has shown a colour limited to the female sex, the male portion being typical.

Good examples are *Dryas niphia* and var. *valesina*, *Colias* and its pale female aberrations, of which *edusa* and its var. *helice* is the best known.

This segregation of the two colours is not always accompanied by a sex-segregation. *Colias edusa* has occasionally produced a female, half *edusa*, half *helice*, and once one with forewings *helice* and hindwings *edusa*.

A phenomenon comparable to this segregation of a typical and a sex-limited colour is known in man. Nettleship once met with

identical (homogeneous) female twins, one colour-blind and one normal. Colourblindness is usually limited to the male sex and is a recessive character, the female only shows it when she has received it from both parents (*cf. grossulariata* and *var. lacticolor*). Identical twins are formed by the separation of the first two cleavage cells derived from the union of a single spermatozoon with a single ovum. Each of these two cleavage cells normally forms one half of the body of a single individual, but when accidentally separated each forms a complete individual alike in all respects.

But for the accident of separation of the two cells, at this early stage of development, an individual would have been produced half colour-blind and half normal, these corresponding to a butterfly, half *edusa*, half *helice*.

Hybrid Gynandromorphs.

The hybrids *Amorpha ocellatus* ♂ × *A. populi* ♀ and × *A. populi* var. *austati* ♀, hybrids *hybridus* and *operosa*, always produce a number of males, a few gynandromorphs and no females.

The gynandromorphs have with one exception a female appearance and are symmetrical. Their sex glands, ovaries, are atrophied and the accessory organs distorted and deficient. The external genitalia show a mosaic arrangement of male and female structures. Somewhat similar gynandromorphs, but with less blending of male and female characters, have occurred in numbers in secondary hybrid *Saturnias* and *Bistoninae*, in which primary hybrid gynandromorphs are very rare. In these crosses primary hybrid gynandromorphs are sometimes halved and five halved gynandromorphs of hybr. *hybridus* are also known. These rare examples are probably of the same nature as halved gynandromorphs of pure race.

Gynandromorphous mongrel insects.

Brake, Goldschmidt and others have produced gynandromorphs by crossing *Lymantria dispar*, Linn., with its var. *japonica*, Motsch. In some crosses they appeared in large numbers and in others were absent.

Altogether three kinds of gynandromorphs were produced :

(1) *Female gynandromorphs*.—These were female in shape and size, with blended male and female colour or a mosaic arrangement of the two colours. They had ovaries, female secondary sex organs and external genitalia.

(2) *Male gynandromorphs*.—These were male in size and shape, and indeed, male in all respects except for patches or streaks of female colour on all the wings.

(3) "*Weibchen-männchen*."—These were exactly like males except for tiny specks of female colour scattered all over the wings. Their sex glands were testes or were lobulated and contained oocytes and spermatocytes in all their follicles.

The external genitalia were male but modified so as to show some approach to female type. In all cases they showed a close approach to bilateral symmetry both internally and externally. Many of these

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gynandromorphs were fertile, the females functioning as females, the males and "weibchen-männchen" as males, but in the more pronounced examples sexual instinct or sexual function was lost.

Familial and Hereditary Gynandromorphism.

Gynandromorphs are calculated by Speyer to occur in nature in a proportion of 1 in 30,000; and, though in certain species such as *Saturnia pavonia*, *Amorpha populi* and *Polyommatus icarus* they occur more commonly, they are very rare even in these. It is, therefore, remarkable that a number of instances are known of several gynandromorphs occurring in one family. Such are the four heterochroic examples of *H. abruptaria*, bred by Simmons, the seven bred by Harrison and Main in *A. betularia*, and five *Aglia tau*, one ordinary and four heterochroic, bred by Standfuss. The most remarkable instance occurred in the honey-bee, *Apis mellifica*. One queen during a life of five years produced hundreds of gynandromorphs, many of them halved. Apart from these only fifteen gynandromorph honey-bees were known up to 1904.

Of races producing gynandromorphs probably by indirect descent one may quote Newman's *A. populi*, which produces about 1%, and Lang's *Aglia tau*, producing 1 in 600. Pantel and Sinéty found in two species of *Diixippus* (Phasmids), which had produced only females parthenogenically for many generations, a few males and halved gynandromorphs in subsequent generations.

Oberthür states that at Dompiere a race of *P. icarus* exists, which gives rise to halved gynandromorphs, of which 27 were taken by one collector in one season.

At Royston there is a race of *Agriades coridon*, which produces a great excess of females, and a small proportion of specimens having one side smaller than the other, and with a variable number of blue scales, male hair scales, androconia on the small side. More than 150 of these have been taken in the last few years. In addition a few examples have been taken with streaks of male colour, but having no male hair scales or androconia. Yet gynandromorphs of this species are excessively rare elsewhere. Kuttner reports an instance of hereditary gynandromorphs in a crustacean *Daphnia pulex*. Many families and four generations were produced by parthenogenesis, all giving about 20% gynandromorphs of predominantly female type, with occasional genetic hermaphrodites and males, the rest being females.

Theoretical Explanations of Gynandromorphism.

The many theories put forward may all be classed under four heads. The first rests on the supposition that they are formed by the fusion of two ova or from a binucleate ovum, the second, that they are derived from an abnormally dividing single ovum. The third is the Mendelian hypothesis based on supposed differences in the potency in the sex factors in different races and species. Scopoli foreshadowed the first by suggesting that his halved gynandromorphous *Phalaena pini*, was formed by the fusion of two pupæ in one cocoon.

Dorfmeister modified this and considered that two ova in one shell became fused and then separated, each uniting with half the other and so forming two gynandromorphs.

Much more probable is Doncaster's theory that gynandromorphs arise by the fertilisation of each nucleus of a binucleate ovum by a separate spermatozoon. The spermatozoa may differ in somatic as well as in sex factors and so produce heterochroism in addition to gynandromorphism. He has proved the existence of such ova and the possibility of their fertilisation in this manner, but points out as an objection that no gynandromorphs were produced by the race in which these binucleate ova occurred.

According to his theory as many heterochroic individuals without gynandromorphism as heterochroic gynandromorphs should appear in broods where heterochroic gynandromorphs have been produced. In the few instances known this has not happened, though simple gynandromorphism and heterochroic gynandromorphism have appeared together.

The second theory was first advanced by Menzel to explain the Eugster bees. According to Dziernou an unfertilised ovum of the honey-bee produces a drone, a fertilised one, a worker or queen. Menzel thought that in the Eugster queen the ova were slow in passing down to the *receptaculum seminis*, and that before they reached this point division of the nuclei had begun. The spermatozoon on entering the ovum fused with one half of the divided nucleus, whilst the other developed parthenogenetically.

The former produced the worker portion the latter the drone portion of a gynandromorph. Boveri supported this view and showed that sometimes hybrid sea urchins were produced, one half containing only maternal chromosomes, the other half containing those derived from both parents. The fatal objection to this view is that it does not explain the production of halved hybrid gynandromorphs with each half showing the characters of both parents to an equal degree.

Lang propounded the theory that an ovum divided and that each half united with a separate spermatozoon. If we accept the view that the example of identical twins, one colour-blind and one normal, was due to the same cause as gynandromorphism and heterochroism, this theory falls to the ground. The identity of this class of twins is due solely to their production by the union of a single spermatozoon with a single ovum.

Lang's alternative hypothesis that halved gynandromorphs are produced by the loss of a Mendelian factor (a mutation) in one of the first two cleavage cells of a normally fertilised ovum appears at first sight to be very satisfactory. When he extends it to explain mosaic gynandromorphs he is obliged to suppose a number of mutations of the same kind occurring simultaneously. Its impossibility is best shown by the heterochroic gynandromorphs with a coarse mosaic arrangement of colours. To explain these he must suppose that two independent mutations can occur simultaneously in a number of separate cells, and that neither can occur without the other. If they did so the areas of one colour would not coincide with the areas of one

sex, and those of the other with the other sex. The improbability of this makes the theory quite untenable.

Goldschmidt and Popplebaum have brought forward a purely Mendelian theory based on their breeding experiments with *Lymantria*. They suppose that sex and secondary sex characters are Mendelian factors (unit characters) comparable to simple somatic factors. In the majority of insects and in birds the male is a homozygous recessive for sex and the female a heterozygous dominant; in mammalia and in some insects the reverse is the case. This view of the sex factors is based largely on the behaviour of sex-limited characters in these groups.

Goldschmidt further supposes that differences in the potency of the factors for sex and secondary sex characters occur in different races of *Lymantria*, the bigger and more deeply coloured var. *japonica* being much more potent than the European *dispar*. In the first and succeeding generations of the cross-bred insects the *japonica* and *dispar* factors become arranged in various ways. Some, for instance, have the *japonica* factors for male secondary sexual characters and the *dispar* factors for the female secondary sexual characters. Though such insects should be females, the *japonica* factor for the male secondary sexual characters is so potent that such individuals show some of the male secondary sexual characters and are gynandromorphs. Many dozens were bred, and the number of female gynandromorphs theoretically expected in the different broods actually appeared. Similarly male gynandromorphs were found to be due to the prepotency of the two *japonica* factors for female secondary sexual characters over the two *dispar* factors for the male secondary sexual characters, and the weibchen-männchen were due to the great relative potency of the *japonica* factor for the male sex, which almost obliterated the female.

His conclusions seem to be well founded as an explanation of the *Lymantria* gynandromorphs. But I do not think they can be extended, as he suggests, to explain all gynandromorphs. The internal and external anatomy of his gynandromorphs is unlike that of the vast majority of natural gynandromorphs. He did not breed a single halved example out of the many dozens produced, though sixteen perfectly halved gynandromorphs of *Lymantria dispar* are recorded in Schultz' lists. The weibchen-männchen, which alone show genetic hermaphroditism, are unlike any natural genetic hermaphrodite, though one of these has occurred in *L. dispar* (a lateral genetic hermaphrodite). The external genitalia intermediate between those of male and female and symmetrical also differ from those found in natural gynandromorphs. In fact, the symmetry of his gynandromorphs is in striking contrast with the asymmetry of most natural gynandromorphs. According to Goldschmidt's theory, heterochroic gynandromorphs must show heterochroism because of a partial dominance of one colour over the other. There are two strong objections to this view. One is that where such partial dominance exists, as in crosses of some black with some white fowls, the result may be a mosaic arrangement of black and white, but never a segregation of black to one side and white to the other side of the body. The other

objection is that in strains in which heterochroic gynandromorphs have occurred, and in which one colour is a simple and complete dominant to the other, further breeding has shown that no change in the potency of the dominant factor has taken place.

Natural gynandromorphs, too, do not appear in numbers large enough to satisfy a simple Mendelian expectation, even in the familial and hereditary cases.

The most probable cause of origin of these natural gynandromorphs seems to me to be an irregular division of chromatin at the first cleavage, one cell obtaining more than its share, one less. In insects unequal division of chromatin can affect:

- (1) *Factors for sex and for secondary sexual characters.*

Example: *Simple gynandromorphism.*

- (2) *Factor for secondary sexual characters alone.*

Example: *Secondary somatic hermaphrodite* like Hertfordshire coridon.

- (3) *Factors for sex and sex limited colour.*

Example: *Gynandromorph* like *Colias*, half *edusa* ♂, half *helice* ♀.

- (4) *Factor for sex limited colour.*

Example individual like *Colias*, half *edusa* ♀, half *helice* ♀.

- (5) *Factor for simple somatic character.*

Example *Heterochroism.*

- (6) *Factors for sex and for simple somatic character.*

Example *Heterochroism and gynandromorphism.*

It is probable that ordinary gynandromorphism is much commoner than that where secondary sexual characters are involved alone, because both the factors for sex and for secondary sexual characters are carried by the same chromosome. Sex-limited characters are thought to be carried by the same chromosome also, and this would account for the relative frequency of the third group. Almost as many *paphia-valesina* gynandromorphs as simple *paphia* gynandromorphs are known.

Gynandromorphous hybrids may be explained on Goldschmidt and Poppelbaum's theory, but most likely the cause is a grosser physical one.

It is well known that the chromosomes of different species and genera often differ in number and size, and that in hybrids normal fusion and subsequent equal division of corresponding chromosomes cannot take place. A chromosome may be wholly lost and the factors borne by it may never appear in the soma of the hybrid. This accounts for the difference in reciprocal crosses and, where sex chromosomes are concerned, may account for gynandromorphism.

The theory of unequal division of chromatin at the first cleavage explains the occurrence of halved insects, but does not explain the incompletely halved and mosaic-patterned insects, which are so frequently met with and differ so markedly from gynandromorphous birds.

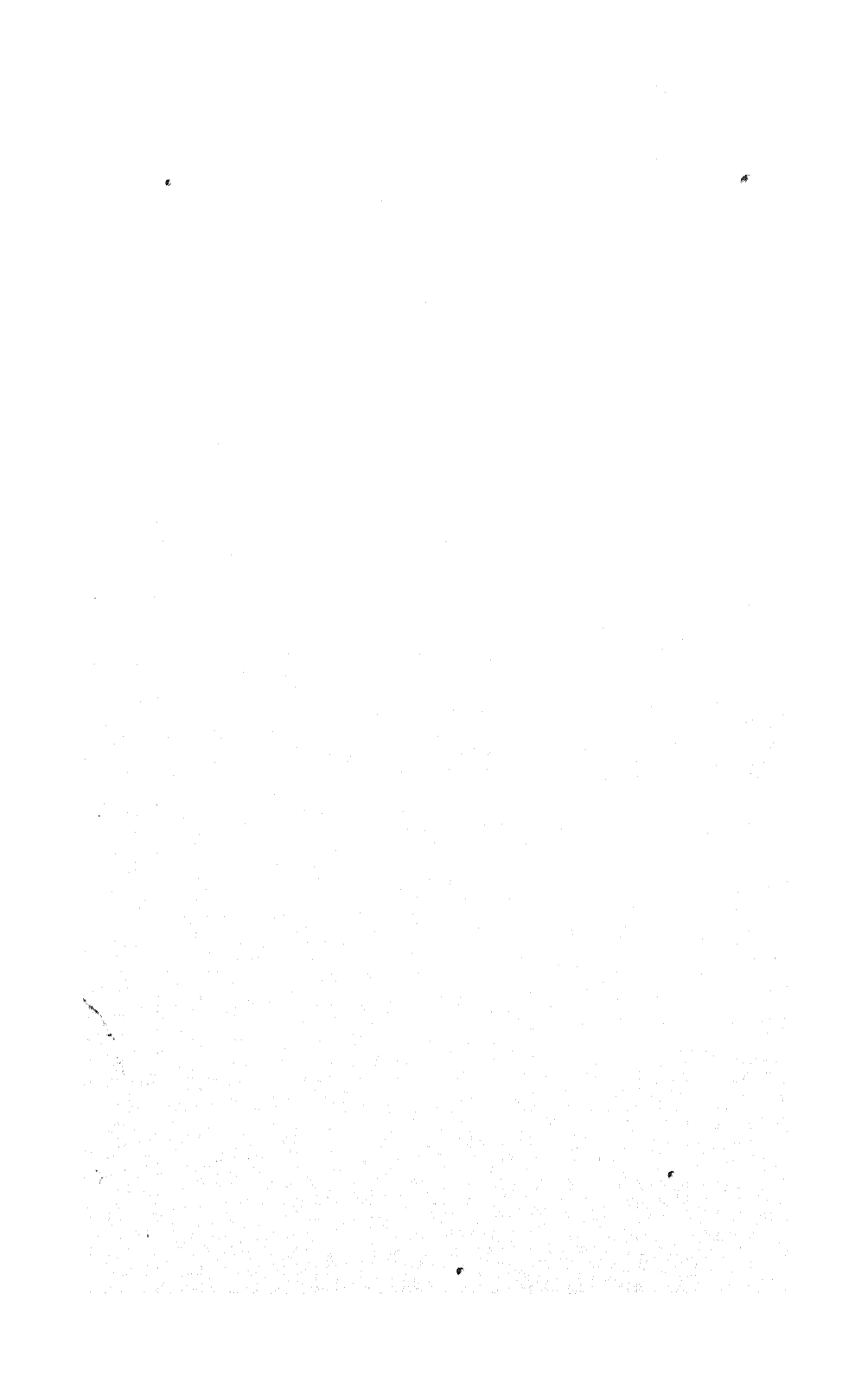
In birds each of the first two cleavage cells gives rise to one half of the body, and so we get a perfectly halved bird with sex organs

and secondary sexual characters, entirely male on one side and entirely female on the other.

In insects, according to this author, there is a syncytial arrangement of the ovum in cleavage and preblastodermic stages, which allows a considerable degree of nuclear migration to take place. Hence we get nuclei with different chromatin content arranged in almost any imaginable way, and, when migration has ceased, the groups of cells formed by subsequent divisions will lead to the mosaic arrangement of sex-glands, secondary sexual apparatus, and somatic structures, which I have already referred to and laid such stress upon.

Naturally nuclear migration is usually slight and so most insect gynandromorphs approximate to the halved condition.

The weak point of the theory is that nuclear migration has not been proved to occur, and its possibility is denied by some authors; its strength is that all the varied conditions met with are explained, including the fact that in heterochroic gynandromorphs, with mosaic arrangement, the areas occupied by one sex and the one colour always coincide.



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 Sauze, H. A., 35, Collingtree Road, Sydenham, S.E.
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 Shaw, V. Eric, F.E.S., "Betula," Park View Road, New Eltham, Kent. (Hym.
 Lep. Micr.)
 Sich, Alfred, F.E.S., Corney House, Chiswick, W.
 Simes, J. A., F.E.S., "Mon Repos," Monkams Lane, Woodford Green. (Lep.)
 Simpson, W., M.B., B.S., "Polmennor," Snakes Lane, Woodford Green. (Arch.
 Bot.)
 Smith, A. C., "Horton," Mornington Road, Woodford Green. (Ent.)
 Smith, C. B., 61, Onslow Gardens, Highgate, N. (Lep.)

- Smith, Mrs., 61, Onslow Gardens, Highgate, N. (Geol.)
 Southgate, F. H., 109, Kensington Avenue, Manor Park, E. (Ent.)
 Spittle, D. G., 91, Wellington Road, Snaresbrook.
 Spragg, E. R., F.G.S., 1, Champion Road, Uxminster. (Bot.)
 Stemp, R., Hinton Villa, Heathcote Grove, Chingford, N.E.
 Stevenson, H. E., F.C.S., 22, Wilton Grove, Wimbledon, S.W. (Chem)
 Stuart, Vernon, West Hill, Putney, S.W. (Lep.)
 Tautz, P. H., F.E.S., Cranleigh, Pinner, Middlesex.
 Thomas, G. O., "Wilfrid Lawson Hotel," Woodford Green.
 Todd, R. G., F.E.S., "The Limes," Hadley Green, N.
 Tremayne, L. J., Whitehall House, 29 and 30, Charing Cross, S.W. (Bot. Lep. Arch., Plant galls.)
 Tremayne, Mrs. L. J., Whitehall House, 29 and 30, Charing Cross, S.W. (Orn. Arch.)
 Van Lessen, R., B.Sc., 69, Downs Road, Clapton, N.E.
 Warren, S. Hazzledine, F.G.S., F.Z.S., "Sherwood," Loughton. (Prehist. Anthropology.)
 Watt, J. Mc B., Monkham's Farm, Woodford Green. (Farming and Orn.)
 Wattson, R. Marshman, 32, St. Andrew's Road, Stoke Newington, N.E.
 Weighell, F., 6, Paddenswick Road, Hammersmith, W.
 Wilde, Mrs. C. L., Lindfield, Marshall Road, Godalming. (Arch. Bot.)
 Williams, C. H., 5, Lower Belgrave Street, Eaton Square, S.W. (Lep.)
 Williams, E., 33, Ashted Road, Upper Clapton.
 Williams, H. B., LL.B., F.E.S., 49, Marchmont Road, Wallington, Surrey.
 Willson, A. J., 46, Dover Road, South Wanstead, Essex. (Lep.)
 Wood, H. Worsley, 31, Agate Road, Hammersmith, W.
 Wrigley, Arthur, 29, Calthorpe Street, Grays Inn Road, E.C. (geol. and prehistoric antiquities.)

* Life Members.

BRANCH ASSOCIATES.

- Arnold, Mrs. C. F., "Lynwood," Victoria Road, Chingford, N.E.
 Bacot, Miss A. H., York Cottage, Loughton, Essex.
 Barratt, A. K., "Idmiston," Monkham's Avenue, Woodford Green.
 Connoll, Miss E., 6, The Ridgeway, Chingford, N.E.
 Earl, Miss P., Amberley, Woodside Road, Woodford Green.
 Hornblower, A. B., 32, Forest Drive East, Leytonstone, N.E.
 Hubbard, A. G., 110, Station Road, Chingford, N.E.
 Hurdle, W., 2, Redland Villas, Carnarvon Road, South Woodford.
 Jones, Miss, 3, Connaught Avenue, Chingford, N.E.
 Kilby, G. S., 54, Lombard Street, E.C.
 Lees, C. H., D.Sc., F.R.S., "Greenacres," Woodside Road, Woodford Green.
 Lewis, T. G., 61, Empress Avenue, Woodford Green.
 Loram, H. Y., 49, Buxton Road, Chingford.
 Parsons, Miss L., 36, Forest Drive East, Leytonstone.
 Rahm, A. W., "Treknew," Monkham's Lane, Woodford Green.
 Rolph, Frank, Harts Stable, Woodford Green. (Micr.)
 Roper, F. W., "Stafford Lodge," Chelmsford Road, South Woodford. (Orn.)
 Roper, H. W., "Stafford Lodge," Chelmsford Road, South Woodford.
 Samuelson, Miss Dorothy, Fairview, 39, The Ridgeway, Chingford, N.E.
 Sheppard, J. H., "Simla Cottage," Snakes Lake, Woodford Green.
 Stevenson, Mrs. H. E., 22, Wilton Grove, Wimbledon, S.W.
 Stratton, Miss Isabel, 37, Buxton Road, Chingford, N.E.
 Thomas, G. W., 86, James Lane, Leyton. (Orn. and Fungi.)
 Watson, J. N., "Lauriston," Mayfield Avenue, Woodford Green.
 Wheeler, Mrs., "St. Conan's," Station Road, Chingford, N.E.
 Wilson, A. J., "Parkdale," Churchfields, South Woodford. (Api.)

COUNTRY ASSOCIATES.

- Allen, William, "Southview," Spa Road, Radipole, Weymouth. (Bot.)
 Bickham, Spencer H., Underdown, Ledbury. (British Phanerogams and Ferns.)
 Blake, Wm., Acacia Villa, Ross, Herefordshire. (Orn. & Conch.)
 Bostock, E. D., Oulton Cross, Stone, Staffordshire.
 Butler, W. E., F.E.S., Hayling House, Oxford Road, Reading. (Lep.)
 Cassall, Dr. R. T., F.E.S., The Surgery, Abertillery.
 Cooke, Rev. P. H., M.A., Ickleton, Great Chesterford, Essex. (Bot.)
 Culpin, M., M.B., F.R.C.S., (Capt. R.A.M.C.), Military Hospital, Cosham.
 Elford, Rodney R., Glencoe House, 139, Rosary Road, Norwich. (Ent.)
 Fison, Eliot Robert, "Sorrento," Brighton Road, Purley.
 Grubb, Walter C., Barberton, Transvaal.
 Hancock, G. D., Mount View, Uffculme, Devon.
 Hopkins, Prof. F. G., M.A., M.D., F.R.C.P., F.R.S., 71, Grange Road, Cambridge.
 (Biochemistry.)
 Longley, W., "Avesbrook," Brook Road, South Benfleet, Essex.
 Miller, Miss E., "The Croft," Rainsford Road, Chelmsford. (Lep.)
 Moore, J. W., Middleton Dean, Middleton Hall Road, King's Norton, near
 Birmingham.
 Porritt, G. T., Elm Lea, Dalton, Huddersfield. (Lep., Neur., Orth.)
 Portway, J. B., jun., 91, The Avenue, West Ealing.
 Studd, E. F., M.A., B.C.L., F.E.S., Oxtou, Exeter.
 Ward, J. Davis, "Limehurst," Grange-over-Sands, Lancs.
 Wood, P. Worsley, M.A., Emmanuel College, Cambridge. (Field Botany).

NOTE.—The following abbreviations are used in the above lists:—*Api.*, Apiculture; *Arch.*, Archaeology; *Biol.*, Biology; *Bot.*, Botany; *Chem.*, Chemistry; *Col.*, Coleoptera; *Conch.*, Conchology; *Dipt.*, Diptera; *Ent.*, Entomology; *Geol.*, Geology; *Hym.*, Hymenoptera; *Lep.*, Lepidoptera; *Micr.*, Microscopy; *Neur.*, Neuroptera; *Orn.*, Ornithology; *Orth.*, Orthoptera; *Ool.*, Oology, *Zoo.*, Zoology.

EXTRACTS FROM MINUTES.

January 5th, 1915.—COMMUNICATIONS.—Mr. C. S. Nicholson reported that at Hornsey in December, 1914, there were 25 wet days and 6·85 inches of rain. In 1914 28·14 inches of rain fell, being nearly 5 inches more than 1913, but 2 inches less than 1912, in which year there were 14 more days on which rain fell.

Mr. A. E. Hodge and Mr. T. H. Archer were elected members.

PRESIDENTIAL ADDRESS.—Mr. L. B. Prout read his address as President for 1914. (Published in 1914 Transactions).

January 19th.—EXHIBITS.—Mr. C. S. Nicholson, Herbarium specimen of a form of the lesser celandine, known as *Ranunculus ficariaformis*, which in the British Isles is restricted to a small part of the Channel Islands, and is a stronger growing plant than the type.

Mr. L. B. Prout: A series of nearly all the British species of the genus *Eupithecia*, including very variable *E. subfulvata* with Scottish forms *cognata*, etc., *pygmaea* captured flying over a hedge in the afternoon at Doncaster, melanic forms of *castigata*, *albipunctata*, *vulgata*, etc. Mr. H. Worsley Wood: *E. castigata* and its melanic variety *ab. obscurissima*, Prout; *E. innotata*, first and second broods, usual forms, and some without the usual markings, all from Durham, and *ab. fraxinota* from Middlesbrough. Also larvæ of *Pieris brassicae*, taken in a garden at Southfields on January 17th, several degrees of frost being registered that morning; when taken they were feeding greedily on cabbage. There are three previous records of these full-fed larvæ in January.

Mr. P. J. Hanson: Eggs of *Ægialitis alexandrina* (Kentish plover); *Æ. hiaticula* (ringed plover); *Sterna sandvicensis* (Sandwich tern); and *Edicnemus edicnemus* (stone curlew); also eggs of *Panurus biarmicus* (bearded titmouse).

The Rev. C. E. Raven was elected a member.

PAPER.—Mr. W. E. Glegg read a paper on "Shore-breeding birds," the paper being illustrated by lantern-slides prepared from photographs taken by Mr. P. J. Hanson.

A vote of thanks was accorded Messrs. Glegg and Hanson.

February 2nd.—POCKET BOX EXHIBITION.—EXHIBITS.—Dr. Cockayne, an extreme specimen of *Rumicia phloea*s, *ab. eleus*, Fb., from Berkhamstead, 1911 (a very hot season), a specimen of *Agriades coridon* *ab. semisyngrapha*, Tutt, from Royston, showing on the left side the characters of *ab. roystonensis*, Pickett (a gynandromorph); also a photograph of the specimen showing the gynandromorphic characters clearly. Mr. C. P. Pickett, a long series of *A. coridon*, the result of four years' collecting, including ♂'s and ♀'s with underside markings

obsolete, abs. *inaequalis*, Tutt, and *roystonensis*, Pickett, and a specimen of the latter in which the male element was on the larger side, instead of on the smaller. A ♀ unequal on the two sides, the lunules larger and brighter on the right side, which was also of the ab. *parisiensis* form beneath. Mr. H. B. Williams, *Mimas tiliae* and some of its commoner aberrations, including ab. *centripuncta*, Clark; *Smerinthus ocellatus* and *Amorpha populi*, including two gynandromorphs from one brood in 1914. Also a drawer of underside forms of *Polyommatus icarus*, including abs. *obsoleta*, Clark, *antico striata*, Tutt, etc., and a series of partially obsolete forms taken in Surrey in spring, 1914, emergence having taken place shortly after a late frost: the obsolete forms were about 33 per cent. of the total captures. Mr. H. Worsley Wood, *Larentia flavicinctata*, type from Rannoch, and a remarkable light local race from Ireland; three yellow abs. of *Brephos parthenias* from Surrey; *Nonagria neurica* and its abs. *fusca* and *rufescens* from East Sussex; *Acidalia immorata* bred as a third brood from Lewes, October, 1913; *Sterrhia contiguaris* and a melanic form; and a drawer of *Xanthia (Mellinia) ocellaris* and all its known British varietal forms, including ab. *lineago*, Gn., and *intermedia* and the allied species *fulvago*, L., and *gilvago*, Esp. and *gilvago* ab. *suffusa*. Also drawings by Mr. Bachlade of the differentiated parts of the genitalia (penis with cornuti) of the sawfly species—*ocellaris*, *gilvago*, and *fulvago*. Mr. J. Riches, a series of *Abraeus grossulariata* bred from wild North-London larvæ from 1905 to 1913, including abs. *nigrosarsata* and *deleta* (*lacticolor*), and one approaching *varleyata*. Also on behalf of Mr. Dewey of Eastbourne, three *Chelonia caja* with yellowish-orange hindwings, bred from wild larvæ in 1914, two *Arctia villica* with confluent markings, bred 1914, and nine *Brenthis euphrosyne* with confluent markings, taken at Abbott's Wood in 1913 and 1914. Mr. G. T. Porritt, *A. grossulariata* ab. *nigrocostata* (a magnificent form), and five ab. *nigrosarsata*, bred from wild Huddersfield larvæ in 1914; also an extraordinary small second brood specimen, bred from a wild larva. Mr. L. W. Newman, series of *Callimorpha dominula* and ab. *rossica*, Kol., from Kent; of *Thecla pruni*, bred 1914, from Hunts; of *Pieris napi* from Ireland, including very strongly marked and yellow ♀'s (summer brood); of *S. alpina* from Rannoch, showing great variation, some being melanic, some red, etc.; two *Mamestra saponariae* from Co. Cork, of a fine, rich pink instead of the usual ochreous: series of *A. coridon* from Herts, showing the local variation with extreme specimens of ab. *semisyngrapha*; of *Boarmia repandata* from Wales; of *Dianthoeia Barrettii* from Ireland and Devon pupæ, and of *Melitaea aurinia* from various localities. Mr. A. W. Mera, two cabinet drawers—(1) a series of *Coenonympha dorus*, showing a wide range of underside spotting, those from the far north being obsolete, and those from Morpeth and Durham intermediate, and *C. pamphilus*, including a specimen with a patch of upperside coloration and an eye-spot on the underside of the left hindwing, one with eye-spot obsolete on one side only, and a red upperside; (2) the British *Acidalids* with melanic forms of *cambricata* and *incanaria*, both modern developments. Mr. R. G. Evans for Mr. W. Harvey, egg parasites of *Sialis lutaria*. Mr.

W. E. King, a long series of *Hybernia defoliaria* from Epping Forest, including five melanic ♂'s. Mr. R. G. Benton: *Orymodis exilis* ab. *assimilis*, taken at sugar at Braemar. Mr. V. E. Shaw, a series of *Cyaniris argyolus*, bred April, 1914, from Sandown (I. of W.) larvæ; specimens of *Salebria semirubella* from Dover, August, 1914, with two specimens of ab. *sanguinella*, and a long series of *Eupithecia extensaria*, bred May, 1914, from Norfolk larvæ. Mr. H. T. Payne, two drawers of *Leucaniids*, including *L. vitellina*, *Nonagria cannae*, *N. arundinis* ab. *fraterna*, *N. sparganii*, *N. bondii*, and *N. brevitinea*. Mr. A. W. Backstone, a specimen of *Brenthis selene*, with most of the usual black markings absent, from Guildford; *Thecla quercus* ab. *bella* from Oxshott; *Polygonommatus icarus*, a fine underside specimen with most of the spots obsolete, from Sevenoaks; *Chaeris graminis*, a pale specimen from Richmond Park, the markings scarcely discernable; *Euchelia jacobae*, a specimen with hindwings smoky black and semi-transparent, bred from a full-fed larva taken at Oxshott, and several ♀ *Bupalus piniaria*, bred from full-fed larvæ taken at the same place, ranging in colour from smoky grey through smoky yellow to dull yellow.

February 16th.—PAPER.—Mr. J. A. Simes, F.E.S., read a paper entitled, "A Month amongst Spanish Butterflies," dealing particularly with the Albarracin district. He exhibited *Thais rumina*, *Euchloe euphenoides*, *Zeyris Eupheme* var. *meridionalis*, *Charaxes jasius*, some *Melitæas*, *Melanargia syllius*, *M. ines*, *M. lachesis*, *Agriades thersites*, including an obsolete form, *C. sebrus*, *N. cyllarus*, *L. hylas* var. *nivescens*, *C. iphioides*, *C. dorus*, *P. zephyrus*, v. *hispanica*, and v. *lycidas*.

Mr. Simes was cordially thanked for his paper.

March 2nd.—EXHIBITS.—Dr. Cockayne (under the microscope), the *Meningococcus* or *Diplococcus intracellularis meningitidis* of Weichselbaum, the organism which causes acute cerebro-spinal fever, or epidemic cerebro-spinal meningitis (spotted fever).

Mr. H. B. Williams, *Brenthis euphrosyne* and a dark variety; *Argynnis aglaia* and a ♂ with dark suffusion in cell of forewings, and a ♀ ab. *suffusa*; *A. paphia* and ab. *valezina*, also a specimen with forewings intermediate between *valezina* and the type, hindwings pallid.

Mr. C. S. Nicholson, herbarium specimens of *Polygonum convolvulus*, the type and the "cornfield form," which is prostrate and turns crimson in autumn.

Mr. Herbert Loney was elected a member.

PAPERS on the "Botany of the District" were read by Mr. C. S. Nicholson, Mr. R. W. Robbins, and Mr. L. B. Hall, those of Mr. Nicholson and Mr. Robbins appear in these transactions.

Mr. Hall spoke of the mosses of Epping Forest. He said he had three species of Sphagnales in his list, there being according to Dixon twelve species in Britain. Of the Bryales there were about 600 in Britain and 108 in the Forest. These were classified thus:—

Nematodontæ	...	...	...	...	...	8
Arthrodontæ	{	Aplolepideæ	...	...	...	30
		Diplolepideæ	Acrocarpæ	...	...	29
			Pleurocarpæ	...	...	41

After an interesting discussion the readers of papers were thanked.

March 16th.—EXHIBITS.—Mr. W. E. King, a gynandromorphous *Hybernia progemmaria*, right side ♀, left side ♂, and a series of *H. leucophaearia*, including abs. *marmorinaria* and *merularia*, all from Chingford.

Mr. C. Nicholson, a complete type collection of British social wasps, some other inhabitants of wasps' nests, and insects resembling wasps; also a specimen of *Sphecophaga vesparum*, lent by Mr. Hamm of Oxford.

Mr. G. T. Porritt was elected a member.

PAPER.—Mr. C. Nicholson gave an address on "Parasites, Paying Guests, and Mimics of Wasps." The species of animals other than wasps recorded as having been found in wasps' nests number 115, viz., Entozoa 1, Crustacea (Isopoda) 2, Arachnida (Acarida) 3, Insecta 109, these being Thysanura 1, Hemiptera 3, Lepidoptera 2, Coleoptera 84, Diptera 14, and Hymenoptera 5. The parasites are:—**Metocercus paradoxus* (col.), **Sphecophaga vesparum* (ich.), *Brachycoma devia* (dip.), **Aphomia sociella* (lep.), *Spharularia bombi* (entozoa); paying guests, **Volucella pellucens* (dip.), **Fannia canicularis* (dip.), **Sphecolyma inanis* (dip.), *Lepisma saccharina* (thys.), **Melissobolus anellus* (lep.); lodgers, **Ocyptus olens* (col. hibernating), **Pterostichus madidus* (col.), *Porcellio scaber* (isopoda), *Iphis bombicolenis* (Acarida); mimics, **Trochilium apiforme* (lep.), **Chrysotoxum octomaculatum* and *cautum* (dip.), **Volucella inanis* (dip.), **Sericomyia borealis* (dip.), **Helophilus pendulus* (dip.), **Strangalia armata* (col.), and **Clytus arietis* (col.). *Those marked thus were exhibited.

Cordial thanks were accorded Mr. Nicholson for his paper.

April 6th.—PAPER.—Mr. J. Ross read a paper on "Hepatics," and exhibits some plants of the family. Lantern slides of various parts of the plants were shown.

April 20th.—COMMUNICATIONS.—Mr. L. W. Newman stated that larvæ of *Pyrameis atalanta* taken in October had pupated in November. The pupæ had been exposed to frost, and were at this date all alive. He suggested that this went to prove that the insect was capable of passing the winter in the pupa state, and that all early (May) specimens had passed the winter as pupæ.

PAPER.—Mr. Arthur Wrigley gave an address on "London Clay and its Fossils," illustrated by specimens from a pit at Chingford. He said that London clay was a marine deposit, and contained marine fossils of genera now tropical or sub-tropical. Remains of the turtle and crocodile, and wood of palms had been found on Sheppey.

The fossils found at the Chingford pit were:—**Lamellibranchia:** *Avicula media* (Sby), **Avicula media papyracea*, *Pecten corneus*, *Pinna* sp., *Modiola simplex* (Sby), **M. elegans* (Sby), *M. tubicola* (S. Wood), **Axinea (Pectunculus) decussatus* (Sby), **Protocardium nitens* (Sby), *P. laytoni*? (Morris), *Cytherea tenuistriata* (Sby.) = *Meretrix suessoniensis* (Watelet), **Syndosmya splendens* (Sby), *Cultellus (Solen) affinis* (Sby),

Teredo* (boring in wood). **Gasteropoda: *Actæon turgidus*? (Desh.), *Planorbis elegans*? (Edw.), *Aporrhais zowerbyi*? (Mant), *Stenothyra* (*Hydrobia*) *parkinsoni*? (Morris), **Natica labellata* (Lam), *Natica* sp., *Voluta elevata*? (Sby), *Pleurotoma insignis* (Edw.), *Pleurotoma* sp., *Borsonia*?, *Cassia ambigua* (Solander) = *Cassidaria striata* (Sby), *Chrysodomus complanatus*? (J. de C. Sby), **C. coniferus* (Sby), *Chrysodomus*?, **Pyrula nexilis* (Brand), **Cancellaria laeviscula* (Sby), *Rostellaria lucida* (Sby), *Litiopa* sp. **Cephalopoda:** *Nautilus* sp. **Pisces:** *Odontaspis cuspidata* (Ag), *Vermetus* sp. * These occurred plentifully.

Mr. Wrigley was heartily thanked for his address.

May 4th.—EXHIBITS.—Mr. E. B. Bishop, herbarium specimens of *Myosurus minimus* (the mouse-tail) from Watton, Herts (1-5-15), and of *Moenchia erecta* from Mardley Heath near Welwyn, Herts.

COMMUNICATIONS.—Mr. W. E. Glegg reported *Totanus totanus* (redshank), *Gallinago gallinago* (snipe), and *Motacilla raii* (yellow wagtail), at Edmonton on April 25th.

PAPER.—Mr. Wilfred Mark Webb, F.L.S., F.R.M.S., Secretary of the Selborne Society, gave an address on "The Brent Valley Sanctuary: An Experiment in Bird Protection." He was cordially thanked for his address.

May 18th.—EXHIBITS.—Mr. C. S. Nicholson, *Barbarea vulgaris* and the rare form *B. stricta*, to show how these plants could be differentiated by the covering of hairs giving a misty appearance to the unopened buds in *B. stricta*, the buds of *B. vulgaris* being glabrous, as well as by the lobes of the leaves, the distinguishing feature mentioned by British systematists.

Mr. G. H. Heath, a long and very varied series of *Peronea hastiana*, bred from larvæ collected in South Wales in an area of 20 sq. yards. Mr. R. W. Robbins, a ♀ of *Pieris napi* from Weston-super-Mare, August, 1913, the tips of the forewings exceptionally black, and the veins covered with black scales on the outer margins of all wings (upperside), especially the hindwings; the specimen was newly emerged when taken. Dr. Cockayne, four gynandrous *Amorpha populi* which he had recently dissected, together with one of the specimens previously dissected by him. He said the dissections seemed to illustrate a tendency for each half of the insect to produce a perfect whole. In some of the specimens certain organs showed a tendency to reduplication, while others failed to develop altogether. (Detailed notes and drawings published in the "Journal of Genetics.")

Mr. H. J. Burkill, Galls of *Rhabdophaga salicis*, Schrank, on *Salix repens*, L, and of *R. rosariella*, Kieff, on the same tree, being old galls of last year from Esher Wood; also galls of *Dasyneura sisymbrii*, Schrank, on *Radicula amphibia*, Druce, from near Bedford.

COMMUNICATIONS.—Mr. W. E. Glegg announced that during the annual outing of the Research Section at Nazing, May 7-10th, 35 species of birds were observed, including *Streptopelia turtur* (turtle dove), and *Totanus totanus* (redshank). A nest of *Phylloscopus trochilus* (willow warbler) was seen, and nests of *Turdus musicus clarkii*

(song thrush), and *Turdus merula* (blackbird) with the eggs broken. He also recorded *Dryobates major anglicus* (British great spotted woodpecker), twice at High Beach. Mr. R. W. Robbins recorded *Oenanthe oenanthe* (wheatear) on Nazing Common.

PAPER.—Mr. A. Sich, F.E.S., read a paper on "A Hawthorn Hedge in Middlesex," which appears in these Transactions.

A hearty vote of thanks was given Mr. Sich for the paper.

June 1st.—EXHIBITS.—Mr. L. W. Newman, a long and varied series of *Pieris napi*, bred from Irish specimens from over-wintering pupæ, including a ♀ with forewings almost entirely black, and ♂s approaching *P. daplidice* in upperside coloration.

Mr. C. S. Nicholson, a remarkable branched form of *Erica cinerea* (purple heath) from near Swanage; it had been suggested that the form might be due to a grub in the root. The flowers were very slightly smaller, and the colour paler than usual. Mr. H. J. Burkill, galls of *Urocystis violae*, Sow, on *Viola sylvestris* from Ruislip, of *Andricus ramuli*, L., on *Quercus robur*, L., from Esher and Oxshott, of *Aphilotric radicis*, Fab, on *Q. robur*, L., from Staffordshire and Surrey, and *Eriophyes dispar*, Nabpa, on *Populus tremula*, L., from Claygate. Dr. Cockayne, galls of *Eriophyes triradiatus* on *Salix fragilis*, from Golders Green.

COMMUNICATION.—Mr. W. E. Glegg reported *Streptopelia turtur* in Epping Forest.

PAPER.—Miss Bagust read a most interesting paper on "The Treatment of Nature in Gothic Design." A summary of the paper is published in these Transactions. Miss Bagust was heartily thanked.

June 6th.—Ornithological Excursion at Chingford.—Nests containing eggs or young birds of the thrush, mistle thrush, blackbird, robin, linnet, blue tit, cole tit, hedge sparrow, and wren were seen.

June 15th.—Special Exhibition of larvæ, etc.—Mr. L. W. Newman, larvæ of *Bombyx quercifolia*, full-fed, *B. trifolii*, in all stages, *Trichiura crataegi* (two forms), *Petasia nubeculosa*, *Geometra vernaria*, *Taeniocampa populeti*, *Grapta C-album*, *Asphalia videns*, *Endromis versicolor*, *Tephrosia crepuscularia*, *Polia chi*, *Euchloë cardamines*, *Larentia multistrigaria*, *Nyssia lapponaria*, *Chesias spartiata*, *Lobophora lobulata*. Mr. H. Worsley Wood, *Agriopsis aprilina* and a parasite worm, *Ledra aurita* (bug), *Cleora lichenaria*, *Asphalia videns*, *Psilura monacha*, *Taeniocampa munda*, *T. stabilis*, *Biston hirtaria*, *Tephrosia crepuscularia*, *Orthosia lota*, *Lygris testata*, *Dyschorista fissipuncta*, *Poecilocampa populi*, *Eupithecia abbreviata*, and on behalf of Mr. Mann, of Wandsworth, *Bombyx neustria* and *Saturnia paronia*. Mr. H. B. Williams, larvæ of *Spilosoma mendica*, *Vanessa urticae*, *Euchloë cardamines*, *Rumicia phloeas*, and *Gonepteryx rhamni*. Mr. A. W. Mera, larvæ of *Euchloë cardamines*, *Bombyx quercus*, *Miselia oxyacanthæ*, *Taeniocampa stabilis*, *T. instabilis*, *Nola cucullatella*, and ova of *Rumia crataegata*. Mr. C. Nicholson, larvæ of *Porthesia dispar*, *Orgyia antiqua*, *Cidaria testata* (Hindhead), *Euprostis chryssorhoea* (Hinton).

Mr. L. J. Tremayne, pupa of *Epinephele janira*. Mr. C. H. Williams, *Anaitis plagiata*, and a suffused form with the inner line entirely obsolete. Also ♀s of *Polyommatus icarus*, including some fine blue forms.

COMMUNICATIONS.—Mr. H. B. Williams recorded *Brenthis euphrosyne* from Wimbledon Common. Dr. Cockayne recorded *Abraaxas ulmata* on June 5th, at Abingdon, a very early date.

Mr. H. J. Burkill, M.A., F.R.G.S., and Mr. Vernon Stuart were elected members.

June 19th.—Excursion to Chalfont.—A series of *Abraaxas ulmata* and a fine specimen of *Asthena blomeri* were taken.

July 17th.—Excursion to Beaumont Manor Estate.—Several galls were found, the best being *Rhodites rosarum*. *Foeniculum vulgare* and *Matricaria suaveolens* were observed.

September 7th.—EXHIBITS.—Mr. J. Ross, a fine group of sporangia of *Leocarpus fragilis* (mycetozoon) on a holly leaf, and sporangia of the same species on a leaf of wood-sorrel and on blades and stems of grass. Also prothallia and young plants of the buckler fern.

Mr. B. Cooper, a variety of *Lycaena aegon*, and a series of *Satyrus semele*, with some very dark ♂s taken in the New Forest in July, 1914. Mr. W. E. King, a specimen of *Epinephele janira* with extra spots, and four *Coenonympha pamphilus*, one mahogany coloured, taken some years ago at Chingford, and one with very light forewing, taken at Horsley in 1915.

Mr. H. J. Burkill, a small midge gall on *Epilobium angustifolium*, not recorded for Britain in Mr. Swanton's book; caused by *Perrisia kiefferina*, Rübs, and found in Surrey and Yorkshire.

September 21st.—EXHIBITS.—Mr. A. W. Mera, *Zyganea trifolii* from several localities, some very near *meliloti*, but having the spots confluent, and two specimens which Tutt described as six-spotted *trifolii*.

Mr. H. J. Burkill, two rare midget galls, one caused by *Perrisia salicariae*, Kieff, on *Lythrum salicaria*, and the other by *Perrisia genisticola* on *Genista tinctoria*.

Mr. J. Ross, specimens of three mycetozoa—*Craterium aureum* (probably the first record from Epping Forest), *Diderma floriforme*, and *Stemonitis herbatica*, the last a poor development gathered as plasmodium, which crept over two holly leaves and formed on the cork of the collecting box under one of the leaves.

COMMUNICATIONS.—Mr. W. E. Glegg reported *Lanius collurio* (red-backed shrike) at Roydon on June 25th, two at Warren Hill, and two at High Beach on July 25th, and two at Warren Hill on August 8th; *Saxicola rubicola* (stone chat), and *Oenanthe oenanthe* (wheatear), at Staines reservoir on August 2nd. Mr. R. W. Robbins recorded a nest of *Columba palumbus* (wood-pigeon) with two eggs, near Yardley Hill, on September 6th; it did not appear that the bird had then started incubating.

Mr. E. A. Aris and Mr. C. S. Bayne were elected members.

PAPER.—Mr. S. Austen read a paper on "Oology," for which cordial thanks were tendered him.

October 5th.—EXHIBITS.—Mr. L. W. Newman, a drawer of *Aplecta nebulosa*, bred from ♀ and ♂ ab. *robsoni*. He obtained 400 ova and reared 350 imagines, which showed 50 % *robsoni*, 24 % *thompsoni*, and 26 % type, a quite novel result in rearing this species. He also showed representatives of a brood of *Boarmia repandata*, bred from ♂ ab. *conversaria* × light Hunts ♀. About 100 specimens were reared, all being ♀ ab. *conversaria*. Mr. G. H. Heath, a long series of *Plutella dalella*, taken on the south border of Durham in August, showing the extensive variation observed in a small wood. Mr. J. E. Gardner, a similar series, and an Epping Forest specimen for comparison. Mr. H. Worsley Wood, a typical *Agrotis vestigialis* from Cromer, and six ab. *nigra*, Tutt, taken "somewhere in Surrey" within the Society's district in 1915; 18 specimens of *Xanthia ocellaris*, bred 1915 (part of a large brood), and undersides of *X. fulvago* and *X. ocellaris* ♂ ♂, showing the pencils of hair. Mr. L. B. Prout, a box of coast Agrotids, mostly from the Scottish coast, including one *A. obelisca* from Stonehaven; he said that Mr. Horne, of Aberdeen, had not known *A. obelisca* to occur there, so that this was a new record.

Mr. C. Nicholson, (Coleoptera), *Lampyris noctiluca*, two ♂ s captured at light at Pitchcombe, Glos., June, 1915; *Phytodecta viminalis*, two beaten from fallow, near Haslemere, 2nd June, 1915, and seven bred from larvæ beaten from the same fallow, attention being directed to the variation of the black markings of the elytra; *Creophilus marillosus*, found under a dead pheasant near Haslemere, 2nd June, 1915; (Hemiptera) *Ledra aurita* from the New Forest, and two pupæ of same from Bookham, June, 1915; *Triecphora vulnerata*, a large black and red froghopper, Grayshott, 1st June, 1915; *Dolycoris baccarum* from mulleins (*V. thapsus*), at Pitchcombe, imagines and nymphal forms in all stages of growth were found on the same plants; (Diptera) *Tipula gigantea*, Hale End, 8th August, 1915; *Ptychoptera contaminata* from grassy pond side at Chingford; *Echinomyia fera* from wild parsnip flowers, Horsley; *Nylota sylvarum* near Burford Bridge; *Limosina coenosa* and puparium, bred from a nest of *Vespa germanica*, and a *Phora* from the same nest, identified provisionally by Mr. J. C. Collin as *P. sublugubris*, Wood, the species is not well known; (Hymenoptera) *Ammophila campestris* from sand pit at Oxshott; a worker of *Vespa vulgaris*, the smallest wasp the exhibitor had seen, the antennæ being disproportionately long. A ♂ and ♀ of *Foenus jaculator* taken at Hale End.

Mr. J. Riches, a "ribbon growth" of *Asparagus officinalis*, from a plant which had produced a similar form for three or four years. Mr. L. B. Hall pointed out that there was only one set of cells, showing that it was the flattening of a single stem and not a true case of fasciation.

PAPER.—Dr. G. B. Longstaff delivered an exceedingly instructive address on "What to observe in common insects," his remarks being

illustrated by a series of beautiful lantern slides from photographs by Mr. Hambl, of Oxford. Dr. Longstaff dealt with many problems of entomology, such as resting position, scents, protective coloration, etc.

A hearty vote of thanks was accorded to Dr. Longstaff with acclamation.

October 19th.—EXHIBITS.—Mr. C. Nicholson, specimens of *Geotrupes typhaeus* from Epping Forest; the ♀ makes burrows in the sandy soil, depositing a "sausage" of triturated rabbit dung at the end of it and laying its eggs therein. A fresh burrow is made for each egg.

Mr. H. J. Burkill, a specimen of *Achillea millefolium* galled by *Eriophyes* sp? found near Godalming by Mr. E. B. Bishop, and only recorded previously from Central Europe and France.

Mr. W. E. King, two *Epinephale tithonus*, one ab. *excessa*, and three *Aricia medon*, including two fine striate forms.

PAPER.—Mr. Hugh Main gave some "Entomological Notes with a Camera in Switzerland," which were illustrated with lantern views from his own photographs. Amongst the insects spoken of was *Cicindela sylvicola*, the tiger beetle, the larvæ of which were found in holes in the banks by the roadside. The larva would come to the surface and block the hole with its head; at the slightest movement it went down like a flash. If a fly, spider, or caterpillar were placed near the mouth of the hole, the larva quickly perceived it, and with a movement so quick that the eye could not follow it, flung itself on its prey (retaining its hold on its burrow only by means of the hooks on the hump of the fifth abdominal segment, and the stiff hairs on its tail pressed against the walls), and disappeared down the burrow. Larvæ of *Myrmelon formicarius* (the ant lion), were found beneath very inconspicuous shallow depressions in loose earth accumulated beneath a low, overhanging cliff. In the neighbourhood of the depressions were dried empty carcasses of ants, earwigs, beetles, and spiders. A few of the larvæ which were brought home, very soon spun their cocoons beneath the surface of the soil, and from these the flies emerged, but the majority hibernated as larvæ. When the perfect insect is ready to emerge, the pupa tears a hole in the wall of the cocoon with its jaws, and thrusts out the fore part of its body, and the fly emerges; sometimes the pupa leaves the cocoon entirely before the emergence of the fly. The fly is a sluggish creature and weak in flight. The odour emitted by the perfect insect is faint and not constant, and was clearly not that of formic acid.

Mr. Main was cordially thanked for his instructive and extremely interesting address.

November 2nd.—EXHIBITS.—Dr. Cockayne, a ♀ mantis from Muros Bay near Cape Finisterre, and three North American *Colias*, viz., *C. eurytone*, *C. philodice*, and *C. eurydice*. Mr. L. W. Newman, a long series of *Pieris napi* from Ireland, including very dark ♂s and ♀s, and a beautiful pale yellow form. Mr. F. J. Hanbury, two ♂ specimens of *Gonepteryx rhamni* marked with orange, one at the tip of the forewing, and the other on the hindwings at the ternus; the first was taken at

Walthamstow by Mr. H. T. Payne, and the second near Malvern by Mr. Dobree Fox. Mr. H. B. Williams, series of *P. napi* and its Irish form, and of *Colias hyale*, *C. edusa*, abs. *helice* and *pallida*, and a long series of *Euchloë cardamines*, including abs. *citronæa*, *minor*, *turritis*, *quadripunctata*, *dispila*, *ochrea*, etc., and the Irish form of the species. Mr. V. E. Shaw, a series of *E. cardamines*, including large and small spotted forms in both sexes, a ♂ with orange patch heavily rayed with black, a ♂ with the orange patch rayed with white between the veins (underside), and two ab. *turritis* taken in 1892 at Caterham. Mr. J. A. Simes, representatives of a few of European *Colias*, including *C. edusa*, and its ab. *helice*, *C. myrmidone*, *C. hyale*, *C. erate*, *C. hyb. sareptensis*, *C. chrysotheme*, *C. palaeno* and its var. *europoma*, *C. aurorina* var. *heldreichii*, and *C. phicomone*. Mr. A. W. Mera, a drawer of *Pieris rapae* and *P. napi* with several interesting forms. Mr. W. E. King, a varied series of *Nemeobius lucina* from Horsley. Mr. C. H. Williams, specimens of *Aporia crataegi*, *Pieris brassicae*, *P. napi*, *P. rapae* (one ♀ with two spots in hindwings), three *P. daphidice*, *Leucophasia sinapis*, and *E. cardamines* and ab. *dispila* ♀.

PAPERS.—Mr. J. A. Simes, F.E.S., read a paper on "Some European members of the genus *Colias*." He regarded the light form as the more ancestral because it occurs as a ♀ aberration in most of the orange forms, and remarked on a preference for pink and red flowers in four common European species.

Mr. L. W. Newman, F.E.S., delivered an address "On breeding *Pieris napi* and its Irish form." He said that he had bred between three and four thousand specimens from Irish parents in the last few years. The species would pair in captivity if allowed a good airy cage out of doors. Horseradish was the most useful food plant. Mr. Newman commented on the species "lying over" in the pupa stage for two years, or two broods, and said he had bred one third brood specimen. He shortly discussed the variation, and referred to the "canary-yellow" form bred by Mr. Head, of Scarborough, of which form he himself had bred one specimen.

Mr. H. B. Williams, LL.B., F.E.S., read extracts from a paper on "The life-history and variation of *Euchloë cardamines*," which is published in these Transactions.

The readers of papers were thanked.

November 16th.—EXHIBITS.—Several members exhibited series of thorn moths. Mr. G. T. Porritt, the melanic form of *Cymatophora* or from Sunderland. The race appears to be confined to a single tree—the only alder in the district, on which a few specimens are taken yearly.

Mr. E. B. Bishop, plants from Lakeland, including the alien *Leycesteria formosa*, found growing in a mountain gully some distance from any garden, apparently bird-sown.

OFFICIAL BUSINESS.—The resignation of Mr. Harold B. Williams of the Minuting Secretaryship, on his enlistment in the army, was announced, and the following resolution passed by the Council was received with acclamation :—

The Council records its warm appreciation of the able services rendered to the Society by Mr. H. B. Williams, both as minute secretary and chairman of the Lepidoptera Committee. Mr. Williams placed his services ungrudgingly at the use of the Society, and his ardour as a lepidopterist made him a valuable member, admirably fitted for the offices he held. His loss will be keenly felt, and we hope to welcome him on his return.

PAPER.—A paper entitled "Tramping and Botanical Reminiscences of a Lakeland Holiday," was read by Mr. E. B. Bishop, and was illustrated by numerous lantern slides. Mr. Bishop also gave some interesting notes on the archæology of the district.

A hearty vote of thanks was accorded Mr. Bishop.

December 7th.—OFFICIAL BUSINESS.—Mr. W. H. Bell was elected a member.

The annual report of the Council, the Treasurer's statement of accounts, and the report of the Research Section were read and adopted.

The following were elected Officers and Council :—

PRESIDENT.—Dr. Cockayne.

VICE-PRESIDENTS.—The Rev. C. R. N. Burrows, Dr. Greenwood, and Messrs. A. Bacot, F. J. Hanbury, A. W. Mera, and L. B. Prout.

LIBRARIANS.—Messrs. W. E. Glegg and A. L. Mera.

CURATORS.—Messrs. S. Austin, C. S. Nicholson, and H. Worsley Wood.

PRESIDENT OF RESEARCH SECTION.—Mr. E. B. Bishop.

TREASURER.—Mr. F. G. Dell.

SECRETARIES.—Messrs. R. W. Robbins and J. Ross.

MEMBERS OF COUNCIL.—Messrs. H. J. Burkill, D. E. Digby, L. B. Hall, L. W. Newman, and V. E. Shaw.

EXHIBITS.—Dr. Cockayne, a series of *Diaphora mendica* and var. *rustica* crosses. Many pairings were secured with perfect fertility all ways. The progeny showed many intermediate gradings from light to dark. Mr. L. W. Newman, on behalf of Mr. G. B. Oliver, varieties of *Coenonympha pamphilus*, including one very fine form with no markings on the hindwings beneath, being unicolorous rich brown; another showed small patches of upperside colouration on the underside of the left hindwing. Also a very fine variety of *Paragae aegeria* with abnormal pale markings. Mr. W. E. King, a male *Epinephelus jurtina* with irregular pale blotches (pathological) on the right side. Mr. A. Bacot, living specimens of *Pediculus capitis* and *P. humanis (vestimentis)*, a group unpleasantly prominent at the present time.

Mr. H. J. Burkill, galls of *Biorhiza aptera* on roots of oak in Richmond Park; of *Eriophyes fraxini* on ash (*Fraxinus excelsior*) from Derbyshire—this gall, though closely related to the gall that has recently spread so greatly on *Salix fragilis*, is apparently not increasing in the same way; and the rare gall of *Callirhytis glandium*, Gerard, on *Quercus leucombeana*, a hybrid oak, in Kew Gardens.

December 21st.—EXHIBITS.—The entomological exhibits "Lycæ-

nidae of 1915," included:—Dr. Cockayne, *Polyommatus icarus* ♀, with splash of very bright blue scales near apex of right forewing, no androconia; *Agriades thetis* (*bellargus*), asymmetry of colour and markings; *A. coridon*, ♂s and ♀s, asymmetrical and deformed, two ♂s, two ♀ dwarfs. Mr. C. P. Pickett, long series of *A. coridon* from Royston, including numerous aberrations and varieties, and 66 gynandromorphs. Mr. W. E. King, *A. coridon* aberrations—upperside; *marginata*, *subsuffusa*, *unicolor*, *aurantia*, *cuneata*, *albolunata*, *radiosa*, *semisyngrapha*; *roystonensis* and gynandromorphs from Royston and Bedfordshire; underside, *castanea*, *impuncta*, *unipuncta*, *tripuncta*, *quadripuncta*, *parisiensis*, *antico-discreta*, *minor*, *obsoleta*, *coridonis*, *antico-obsoleta*, *striata*, *costajuncta*. *Polyommatus icarus*, abs. upperside, *nigromaculata*, *fusca*, *supracerulea*, *atrescens*, *flavescens*, *caerulea*; underside, *melanotoxa*, *discreta*, *aurea*, *apicojuncta*, *costajuncta*, *basijuncta*, *transiens*, *icarinus*, *antico-obsoleta*, *postico-obsoleta*, *obsoleta*, *sub-obsoleta-extensa*, *striata*. Mr. C. H. Williams, many forms of *A. coridon* from Royston, and a fine series of *P. icarus*, including some striking underside abs. Mr. G. T. Porritt, variations of *Abraxas grossulariata* from ab. *nigrosparata* to ab. *nigra*.

Mr. H. J. Burkill, an abnormal growth on *Erica tetralix* from the Black Pond, Esher, really the cocoon of a midge.

Mr. J. Ross (under the microscope), sporangium of the mycetozone, *Comatricha elegans*, probably the first Essex record.

COMMUNICATIONS.—Mr. Austin reported observing on December 19th *Pyrrhula pyrrhula pileata* (British bullfinch) near Loughton, *Alcedo ispida* (Kingfisher), and 18 *Nyroca fuligula* (Tufted duck) at Connaught Water.

Mr. C. Flowers and Mr. E. Kay Robinson were elected members.

PRESIDENTIAL ADDRESS.—Dr. Cockayne, M.A., D.M., F.E.S., delivered his presidential address on "Insects and War," for which he was cordially thanked. The address is printed in these Transactions.

COUNCIL'S REPORT FOR 1915.

A year of anxiety and stress, such as we have passed through as a nation, has inevitably been one of somewhat limited work for our Society; it was not a time when new projects could be undertaken with a reasonable prospect of success, and your Council have striven to maintain our existing organisation and activities.

More of our Members have joined the Forces. Our President was away on service during the autumn, but for the present is with us again. Through enlistment we have recently lost the services of Mr. H. B. Williams, who acted so ably as Minuting Secretary and as Chairman of the Lepidoptera Committee, and took a leading part in that Branch of the Society's work. A resolution recognising the valuable work Mr. Williams has done for the Society, and the loss his removal entails, has been placed on the minutes of the Council.

The Members who are or have been on service are :—

A. E. Cockayne, M.A., D.M., F.R.C.P., F.E.S.

M. Greenwood, Jun., L.R.C.P., M.R.C.S.

H. B. Williams, LL.B.

L. Eynon, B.Sc., F.I.C.

A. L. Mera.

H. Worsley Wood.

(The above were Officers of the Society before they went on service.)

T. H. Archer.

G. S. Kilby.

W. H. A. Austen.

H. A. Kind.

R. C. Barnes.

E. B. Latham.

A. K. Barratt.

R. Latham.

J. V. C. Braithwaite.

T. E. Legg.

T. W. Brooke.

S. G. Lewis.

J. W. Brown.

J. P. Pearce.

C. L. Collenette.

F. Reynolds.

M. Culpin, M.B., F.R.C.S.

E. F. Studd.

H. Digby.

G. O. Thomas.

F. W. J. Jackson.

R. S. Gwatkin Williams.

Not only have these members been removed from our midst, but other members, in various ways due to the War, have been unable to attend our meetings as they would in normal times. Zeppelin raids have also kept some members from attending meetings, and at times tended to shorten our proceedings.

As anticipated, the great difficulty that the Society has had to face has been financial. Besides the loss arising from members being on service, the number of other subscriptions unpaid is much larger than usual. This is caused by prevailing conditions, but none the less a reduced revenue must be anticipated in the coming year which must be one of severe and maintained economy.

• A handsome gift of birds' eggs has been received from Mr. Herbert Massey, F.E.S., of Burnage. In recognition of his generosity the Council elected Mr. Massey an honorary member of the Society.

The work of botanical recording for the district south of the Thames has been commenced. There is a good prospect of a Research Committee being formed to study Plant Galls, in the coming year.

The number of volumes borrowed from the Library is 39 per cent. greater than last year, and considering the reduced attendances must be considered eminently satisfactory. This fully proves the value of the new catalogue placed in the hands of members early in the year.

The year on which we are entering will be one of restricted activity, but your Council will use its best endeavours to maintain the Society's organisation, and in their efforts they ask for the loyal and cordial support of all members, that when the members on service return to us they may find the Society unimpaired in its several spheres.

REPORT of the RESEARCH SECTION for 1915.

Apart from the excellent specialised labours of the already existing Committees, the results of which are duly set out in their accompanying Reports, the general work accomplished by the Research Section may be summarised as follows.

The Research Board for 1915 has comprised Messrs. C. S. Nicholson, R. W. Robbins, W. E. Glegg, H. B. Williams, and myself. Mr. H. B. Williams has acted as Secretary.

Following upon the extension of the Society's district, Mr. C. S. Nicholson, who has for several years so ably acted as Recorder and Secretary to the Botanical Committee, notified the Board that whilst he would continue to act as regards the northern portion of the district, he could not undertake to do so for the southern portion. In the absence of a more capable volunteer, I have taken up the latter duty, and am engaged in forming a Committee. My interim Report in that capacity is annexed.

Chiefly as a consequence of the War, the hopes expressed in the Report for 1914, respecting the formation of a Mammalia Committee, have not been realised, and no further progress has been made in connection with the suggested Photographic Committee. In each case there is little doubt but that the advent of a capable leader would soon attract the support needed to form a useful Committee.

There is good reason for hoping that a Committee for the study of Plant Galls will be formed during the coming year.

The second annual week-end of the Research Board, spent on this occasion at "Ye Olde King Harold's Head" Inn, on Nazeing Common, Essex, May 7th-10th, was a most enjoyable one. The "house party" numbered eight members, whilst nine others came down for a whole day or a part of one. No startling records were made in any department, but much quiet work was accomplished, and good fellowship created and cemented. The value of the latter in a Society such as ours, cannot be over-estimated. Seeing that the Society as a whole (perhaps quite wisely, in view of its size), now only indulges in excursions, limited at the most to a few hours, our various Sections and Committees, by means of these week-ends, minister most successfully to one of the most human of all human cravings, that of comradeship. Day and half-day outings are absolutely indispensable, but they cannot possibly bring members and friends into such close personal contact as do our inimitable week-ends.

In conclusion, I appeal most earnestly to any member, or prospective member, interested in Mammalia, Photography, or Plant Galls (in particular), or in any other department of Natural History (in general), to communicate with me with a view to the formation of new Committees.

E. B. BISHOP.

President of the Research Section.

INTERIM REPORT OF BOTANICAL COMMITTEE FOR SOUTHERN PORTION OF DISTRICT.

The work during 1915 has been largely preparatory, and no formal meeting of the Committee has yet been held. Recording sheets based upon those in use for the northern portion have been prepared, one of which is annexed. A map, composed of the necessary number of one-inch Ordnance Survey sheets, has been mounted on rollers, the boundaries of the sub-divisions set out, and each sub-division marked in colour. It has been decided to accept no records prior to 1913. The arrangement and nomenclature to be followed will be that of the London Catalogue, 10th edition.

About 350 species have already been recorded from one or more of the sub-divisions, the vast majority, however, being very common species. A few aliens and casuals help to swell the list. The following less common or more interesting species have been considered worthy of note:—

Fumaria densiflora, DC.
Barbarea stricta Andr.
Coronopus didymus, Sm.
Lepidium ruderales, L. (From
 2 sub-divisions).
Lepidium draba, L. (From 2
 sub-divisions).
Geranium pratense, L. (Situa-
 tion not quite free from
 suspicion).
Impatiens biflora, Walt.
Impatiens parviflora, DC.
Medicago arabica, Huds.
Crataegus oxyacantha, L. (= *oxyacanthoides*, Thuill).
Eurothera biennis, L. (From
 3 sub-divisions).
Smyrniolum olusatrum, L.
Anthriscus vulgaris, Bernh.
 (From 2 sub-divisions).

Filago apiculata, G. E. Smith.
Matricaria suaveolens, Buch-
 enau.
Taraxacum erythrospermum,
 Andr.
Vaccinium myrtillus, L.
Nymphoides peltatum, Rendle
 and Britten.
Myosotis sylvatica, Hoffm.
Atropa belladonna, L.
Veronica montana, L.
Polygonum bistorta, L.
Buxus sempervirens, L. (Appar-
 ently wild).
Carpinus betulus, L. (Not
 common south of Thames).
Neottia nidus-avis, Rich.
Ophrys muscifera, Huds.
Carex pallescens, L.
Ceterach officinarum, L.

In view of the magnitude of the task before me, and the impossibility of covering personally more than a small fraction of the ground, I appeal to all members to send me *exact* localities of all plants observed in the southern portion of our district, with specimens whenever possible. Records of the commonest species, with full data, are needed equally with those which are rare or local. I trust that the members of other Committees will bear this appeal in mind when collecting or tramping in the southern portion of our district.

E. B. BISHOP.
 Secretary and Recorder.

BOTANICAL COMMITTEE.

In consequence of nervous prostration following upon a motor accident, Mr. C. S. Nicholson has unfortunately been unable to furnish any report upon the work of the Botanical Committee during 1915. In the circumstances, the Council expresses the sincere sympathy of all members with Mr. Nicholson, and the hope that he will soon be restored to health.

 ORNITHOLOGICAL RESEARCH COMMITTEE. ANNUAL
REPORT FOR 1915.

Although the Society's district has been increased by the inclusion of the ground within the twenty miles radius south of the Thames, the Committee has decided, for the present at least, to confine its attention to a continuation of the survey of the area north of the river. Five birds, new to the district, have been recorded during the year, but no addition has been made to the number of breeding species. The number of species recorded now stands at 142.

The new occurrences are as follows :—

Charadrius apricarius (Golden Plover). Several were shot at Loughton in December, 1914, by Mr. R. P. Sewell. Reported per S. A.

Upupa epops (Hoopoe). One shot at Southgate, May, 1907, by Mr. A. Myford. Reported per P. J. H., who has seen the mounted specimen.

Limosa limosa (Black-tailed Godwit). One shot in 1911 at the Sewage Farm, Angel Road, Edmonton, by Mr. W. Joyce, in whose collection the specimen now is. Reported per W. E. G.

Asio accipitrinus (Short-Eared Owl). One shot about 1908, at the Sewage Farm, Angel Road, Edmonton, by Mr. W. Joyce, in whose collection the specimen now is. Reported per W. E. G.

Larus glaucus (Glaucous Gull). Adult seen on 20th March, 1915, on the ice in St. James's Park, by Mr. Clifford Borer. See "British Birds," vol. 8, p. 269.

Other notable records are :—

Machetes pugnae (Ruff). Male and female obtained at Chingford on 4th September, 1915, by Mr. W. W. Hartwell. Reported per W. E. G.

Tringa alpina (Dunlin). One shot at the Sewage Farm, Angel Road, Edmonton, in 1905, by Mr. W. Joyce, in whose collection the specimen now is. Reported per W. E. G.

Rallus aquaticus (Water Rail). One shot at the Sewage Farm, Angel Road, Edmonton, in 1906, by Mr. W. Joyce, in whose collection the specimen now is. Reported per W. E. G.

Phylloscopus sibilatrix (Wood-Warbler). Seen and heard in Epping Forest on 16th, 23rd, and 30th May, and 18th June, also near Broxbournebury on 24th May, 1915. Reported by Mr. W. E. Glegg.

The Committee has held during the year eight meetings, which include four informal meetings, also two excursions.

The work done under the auspices of the "British Birds" marking scheme shows a serious falling off, only 65 birds having been ringed during the season.

One recovery is reported:—

Parus caeruleus obscurus (British Blue Titmouse), ringed at Hale End, 6th October, 1912, recovered same place, 29th December, 1914.

Mr. P. J. Hanson has consented to make himself responsible for the care of the photographic collection, which makes good progress.

The Committee has decided to adopt the nomenclature of the list of British Birds published by the British Ornithologists' Union this year. The ornithologists of the Society are invited to support the Committee in its action.

The Committee has provided four items for the syllabus:—On 19th January, a Paper, "Shore-breeding Birds," by P. J. Hanson and W. E. Glegg; on 4th May, a Paper, "The Brent Valley Sanctuary: an Experiment in Bird Protection," by Wilfred Mark Webb, F.L.S.; on 5th June, a ramble; and on 21st September, a Paper, "Oology," by S. Austin.

It is hardly necessary to state that the War has seriously affected the work of the Committee. Mr. F. Reynolds has joined the Army, and the remaining members have had little time to devote to ornithology.

It is to be regretted that the Bird Sanctuary Committee no longer exists. It was stated in last year's report that difficulties had arisen with the new owner of the wood, and as, in spite of the efforts of the Committee, these could not be overcome, nothing remained but to dissolve the Committee. The effects have been sold, and, with the consent of the Council, the sum realised is to be devoted to the purchase of volumes 1 and 2 "British Birds."

For the Ornithological Committee,

WILLIAM E. GLEGG, *Secretary*.

November 12th, 1915.

LEPIDOPTERA COMMITTEE. REPORT FOR 1915.

1. The work of the Committee in 1915 has suffered, in common with that of the Society as a whole, from the difficult conditions brought about by the war. A certain amount of useful work has been done and various schemes are in process of development. The membership of the committee has been increased and now consists of Mr. H. B. Williams (chairman), Dr. E. A. Cockayne, and Messrs. H. T. Payne, R. W. Robbins, V. E. Shaw, L. J. Tremayne, H. W. Wood, J. E. Gardner, and L. B. Prout.

2. The condition of the Society's collections has been discussed and a fund opened for the purchase of a new cabinet. The fund now amounts to £7 1s. 6d. The cabinet will probably cost £10 or £11 and further subscriptions are invited. A collection of Micro-lepidoptera is in process of formation.

3. The Librarian has drawn attention to the fact that the Society does not possess the Transactions of the Entomological Society of London, and it is hoped that members who have spare copies will present them to the Society, so that a series may be placed on the shelves.

4. The Committee has held one formal meeting and one week-end excursion during the year, and the study of Lepidoptera has been kept well to the fore by a series of special exhibitions at the meetings of the Society. A very successful discussion on the "Pieridæ" was arranged and papers were secured for both the central society and the local branches.

5. A certain amount of individual research work has been completed during the year.

6. Mr. Williams having temporarily resigned his duties owing to his going on active service, Mr. Tremayne is acting as chairman.

HAROLD B. WILLIAMS.

November 10th, 1915.

ARCHAEOLOGICAL COMMITTEE. SEVENTH ANNUAL REPORT (1915).

1. During the year 1915, the Committee has made the following inspections within the Society's local district:—

(a) January 23rd, St. Helen's Church, Bishopsgate.

(b) April 24th, Eltham Palace, Kent.

(c) October 9th, Stoke D'Abernon Church, Surrey;

and outside the district:—

(d) July 10th, Earl's Barton Church, Northants.

The latter inspection was made during the annual week-end outing, which was spent at the Griffin's Head Inn, Mear's Ashby, Northants. The week-end was, as usual, a thoroughly successful and enjoyable one. Seven members and one visitor attended for the whole period, *viz.*, July 9th-12th.

The compilation of official records in connection with the above inspections will shortly be completed, and they will then be placed in the Society's Library.

2. The following papers have been provided, at the instance of the Committee, for the Society's syllabus:—

(a) April 26th. "Stones of English History," by R. Marshman Wattson (read at the Woodford Branch).

(b) June 1st. "The Treatment of Nature in Gothic Design," by Miss F. Bagust (read at Salisbury House).

3. The paper by Mr. E. Chapman, read on November 3rd, 1914, at Salisbury House, has been selected by the Transactions Committee for publication in the volume of Transactions for that year.

4. Mr. E. Chapman has been elected to represent the Committee on the Transactions Committee for 1916.

5. The membership of the Committee remains at nine—as before.

(Sgd.) E. B. BISHOP, *Chairman.*

(Sgd.) S. AUSTIN, *Hon. Sec.*

November 6th, 1915.

WOODFORD BRANCH. REPORT FOR 1915.

The Woodford branch has suffered severely from war conditions during the last year. Twelve members who attended our meetings are serving with the colours, and others are, for the time being, prevented from being present. Support is therefore earnestly requested.

At the beginning of the year we lost the services of our Chairman, Mr. Hornblower. He had very ably filled this position since the founding of the branch, but owing to increased duties brought about by the war, he was unable to continue to be present at the meetings, and consequently gave up the office. He was succeeded by Dr. R. Armstrong-Jones, who took a very great interest in the branch, but, unfortunately, he, too, is unable to continue with us.

Mr. G. A. Pibel has now been elected chairman for 1916, and our thanks are due to him for accepting the office.

We have also lost the services of our Secretary, Mr. Stevenson, who has removed to South London. The work has now been taken over by Mr. D. E. Digby.

During the year one new member and one associate were added to the register.

Ten meetings were arranged, but were not attended by so many members as were the meetings before the commencement of the war. The February meeting had to be abandoned owing to the very small attendance. The subject for the evening was to have been "Caves and Underground Waters of the Yorkshire Limestone," by T. R. Burnett, D.Sc.

The following meetings were held during the year:—

January 25th.—"Trees in Winter. How to name them," F. G. Gould.

March 29th.—"Some Notes on European Ethnology in 1915," E. Samuelson.

April 26th.—"Stones of English History," R. Marshman Watson.

May 31st.—"The Finch Family," A. G. Hubbard, B.Sc.

June 28th.—"The Practical Application of Entomology to the Service of Mankind," H. B. Williams, LL.B.

September 24th.—"Wireless Telegraphy," Prof. F. Womack, B.Sc., M.D.

November 1st.—"Mountaineering in Switzerland," Sir George H. Savage, M.D., F.R.C.P.

November 29th.—"Mycetozoa," Miss Lister, F.L.S.

December 31st.—Informal meeting. Lecture, "The relation of Man to the lower animals," Miss J. D. MacIntosh.

Unfortunately, owing to the post office prohibitions, Professor Womack was unable to bring all his apparatus for his lecture in September, but he had a number of very interesting slides.

The meeting of November 1st was held in conjunction with the Woodford Guild, and many excellent slides were shown by Sir George H. Savage, who is an ardent mountaineer.

The two field meetings which were arranged for July and August

were both rendered practically impossible owing to exceedingly heavy rain, but two members ventured out for a walk in the Forest on July 24th, and found, amongst other things, Centaury (*Erythraea centaurium*) and Adder's Tongue Fern (*Ophioglossum vulgatum*), both of which are rather good "finds" for the Forest.

CHINGFORD BRANCH REPORT FOR 1915.

Chairman: T. R. BROOKE, F.R.M.S.

Secretary: E. SAMUELSON, 39, The Ridgeway, Chingford.

Notwithstanding the fact that the whole of 1915 was a year of War, and that several of our members have been absent on service, the interest in the Chingford Branch has, under the circumstances, been well maintained. There have been nine meetings, the highest attendance being 30, the lowest 8. The average of the year being a little higher than that of the War months of 1914.

There have been four resignations, but again this we have several new members and associates joining in 1916.

The following papers have been presented:—

- * "Wasps and their ways," by C. Nicholson, F.E.S.
- * "The Finch family," by A. G. Hubbard, B.Sc.
- * "The declining Birth-rate," by Dr. M. Greenwood, jr.
- * "North Wales," by Rev. W. H. Dewhurst, M.A.
- * "Flowers and flower hunting," by E. R. Spragg, F.G.S.
- * "The smaller British Butterflies: Hairstreaks, Blues, and Skippers," by R. W. Robbins.
- * "The growth of the Mind," by Dr. R. Armstrong-Jones.
- * "Love's Meinie," being notes on John Ruskin's lectures on the Robins, the Swallows, and the Dabchicks, by Rev. A. F. Russell, M.A.
- * "British Weasels," by E. Samuelson.

It is gratifying to note that all the above papers were contributed by members of the Society.

The usual weather reports were kindly contributed by Miss Mathieson and Mr. H. C. Greengrass, to whom the thanks of the Society are due.

Mr. T. R. Brooke found his business engagements too exacting to continue the chairmanship of the Branch. We have been fortunate in securing the services of Canon Russell, the Rector of Chingford, as our new Chairman.

The warmest thanks of the Branch are due to Mr. Alan Robbins for so regularly acting as our lanternist.

THE NORTHERN DISTRICT.

The boundary of the Society's district north of the Thames starts from that river north of Egham, and passes through Gerrard's Cross,

Those marked thus * were lantern lectures.

Chorley Wood, King's Langley, north of St. Albans, between Hatfield and Welwyn, through Bengeo, Ware, Burnt Mill, High Ongar, Shenfield, and Orsett, to the Thames at Tilbury. It is divided into twelve districts, the boundaries of which, with brief geological data, are as follows:—

1. Colnbrook ... N., the Oxford Road; E., River Colne; S., River Thames; W., District boundary. Alluvium in the River valley. Gravels and sands on higher levels with some large woods.
2. Rickmansworth ... N.W., District boundary; N.E., the Dunstable Road; S.E., River Colne; S.W., the Oxford Road. Similar to 1, but with chalk on the valley slopes and some clay.
3. Hounslow ... N., the Uxbridge Road; E., River Brent; S., River Thames; W., River Colne. Almost all valley gravels. Many market gardens.
4. Harrow ... N., the road from Bushey *via* Elstree to Barnet; E., River Brent and Dollis Brook; S., the Uxbridge Road; W., River Colne. Mainly London clay. Open agricultural land. Chalk along the Colne Valley, capped with sands.
5. Mimms ... N., District boundary; E., the Great North Road; S., the road from Bushey *via* Elstree to Barnet; W., River Colne and the Dunstable Road. Hilly with scattered woods. Clays, gravels, and chalk.
6. Hampstead... N., the road from Barnet to Enfield; E., the New River; S., River Thames; W., River Brent and Dollis Brook. London clay and gravels. A patch of Bagshot sand at Hampstead, and of Boulder clay at Finchley.
7. Enfield Chase ... N., District boundary; E., New River; S., road from Barnet to Enfield; W., the Great North Road. London clay capped with gravels. Much Boulder clay in the North. Extensive woodlands.
8. Lea Valley ... N., District boundary; E., the road from Roydon *via* Nazeingbury and Waltham Abbey to Walthamstow, the Midland Railway and River Roding; S., River Thames; W., the New

- River. Almost entirely alluvium and valley gravels.
9. Epping N.E., District boundary; S.E., River Roding; S. and W., the Lea Valley boundary. London clay throughout, with plateau gravel on higher ground. Epping Forest and Ongar Park Woods.
 10. Hainault N. and W., River Roding; E., the road from Passingford Bridge *via* Havering to Romford; S., the Great Eastern Railway main line. Similar to 9. Hainault Forest.
 11. Brentwood N.E., District boundary; S., railway from Romford to Upminster and Laindon; W., the road from Passingford Bridge to Romford; N.W., River Roding. London clay, much Bagshot sands round Brentwood, with woods and heaths. Boulder clay round Navestock.
 12. Rainham N., railway from Ilford to Romford, Upminster, and Laindon; E., District boundary; S., River Thames; W., River Roding. Marshland, alluvium and valley gravels. Chalk outcrop, Purfleet to Grays.

OUTER BOUNDARY OF SOUTHERN AREA.

Starting from river Thames at Runny Mede, passing a little W. of Egham Church, thence $\frac{1}{4}$ mile W. of Thorpe Church, thence $\frac{1}{2}$ mile W. of Chertsey Church, exactly by Addlestone Church, crossing L. and S.W. Railway main line a mile N.E. of Byfleet Station, crossing Portsmouth main road at 8 mile-stone from Guildford, crossing L. and S.W. Railway (new Guildford line) by Newmarsh Farm, passing exactly by Great Bookham Church, crossing L.B.S.C. Railway $\frac{1}{2}$ mile N. of Box Hill Station (L.B.S.C.R.), passing through Brockham Warren, thence $\frac{1}{2}$ mile N. of Betchworth Church, thence just S. of Windmill on Reigate Heath, crossing L.B.S.C. Railway just S. of Earlswood Station, crossing S.E. Railway little over a mile S. of Bletchingley, passing about $\frac{1}{3}$ mile N. of Godstone Station, crossing L.B.S.C. Railway (Oxted and East Grinstead branch), 2 miles S. of Oxted Station, passing through S. end of Crockham Hill Common, thence $\frac{1}{2}$ mile N. of Toy's Hill, crossing S.E. Railway $\frac{1}{2}$ mile S.E. of Riverhead Church, passing almost exactly by Kemsing Church, thence by Kingsdown Windmill, through Ash Village, crossing S.E. Railway at E. edge of Hartley Wood, passing a little E. of Northfleet Green, thence between Northfleet and Gravesend to River Thames at Northfleet Pier.

PRESIDENTIAL ADDRESS.

(Read December 21st, 1915, by E. A. COCKAYNE, M.A., D.M., F.R.C.P., F.E.S.)

Eminently quiet and peaceable as the pursuit of Entomology at first appears to be, yet it is not wholly divorced from practical utility in the prosecution of war. It is for this reason that I have chosen the subject of "Insects and War" for my Presidential Address to-night. Of the effect of insects on the rise and fall of nations during periods of peace I will say little.

The death of all the first-born of Egypt after the plague of flies has been attributed by Bland-Sutton, probably with truth, to an epidemic of summer diarrhoea, conveyed by those insects. Who can tell how far the death of these young children modified the history of Egypt. Mosquitoes, in the opinion of W. H. S. Jones, played a large part in the decadence of Ancient Greece, carrying the organism of malaria and spreading it wholesale amongst a people hitherto free from this malady. Their fall was partly due to the amount of acute disease and the number of deaths caused thereby, but far more to the baneful effect on the character of the race caused by chronic malarial cachexia. Malaria is still the curse of Greece, and all the weaknesses of the Greek nature have been only too apparent during the last few weeks.

Important as the long years of peace are for building up a nation, and great as the influence of insects may be in hindering its development, it is clear that all the greatest crises in a country's history occur during its wars, and it is at these times that insects, as carriers of disease, may cause disasters which can never be repaired. In olden times diseases were never separated correctly into their respective kinds, and so nearly all histories of great pestilencies of the past leave us in some doubt as to their exact nature; and this is especially true of war pestilences. Indeed, from accounts of many of these, it is obvious that more than one disease was rife at the same time. It is only since we have been able to recognise and isolate their causes in the form of various minute parasites, and have learnt their different modes of entrance into the human body, that we have been able to analyse correctly the effects due to each, and to restrict their spread by rational hygienic measures. Hence we shall never know, though we may speculate upon it not unprofitably, how far insects might have modified the course of the present war, where millions are fighting in place of thousands, and men from all parts of the earth are mingled together in a way never known before, bringing with them their peculiar parasite of disease, bacterial or protozoan.

For my present purpose I will divide the diseases of war into three groups; and in the first I place those conveyed without the agency of insects, in the second those spread sometimes by insects, sometimes independently of them, and in the third those invariably carried by insects.

Much ill-health, and at times a very high mortality, may be caused

by the first group, amongst which are small-pox, influenza, scarlet fever, measles, and cerebrospinal meningitis; but the diseases most closely associated with the wars of the past and present are met with amongst those in the last two groups. Of those conveyed in both ways, my second group, are enteric or typhoid fever, paratyphoid, the dysenteries and cholera, and plague may be added, though it stands on a somewhat different footing.

In peace-time the first four of these, in all of which the causal agent enters the system by the mouth, epidemics usually arise through an infected water supply, but in war-time their spread by means of insects reaches very high proportions.

But before insects can spread a disease its parasite must be present, and in the case of these intestinal diseases the parasites cannot live long outside the body. Fresh outbreaks are due to the fact that they can live and multiply for months or even years in people who have recovered from the clinical manifestations of the disease, or even in those who have never shown them. Such individuals are now technically known as carriers. Unfortunately we may be sure that wherever large bodies of men come together drawn from a wide area, some will come from places where these diseases are endemic. The parasites constantly leaving the bodies of these people in a virulent state act as the starting point for fresh outbreaks.

Flies, by their indiscriminate tastes and constant activity, readily contaminate food and drink, in spite of the careful attention now paid to obtaining a pure supply and to take all the sanitary precautions possible to prevent them reaching contaminated material. The most dangerous flies regarded from this standpoint are the common house-fly, *Musca domestica*, the latrine-fly, *Fannia scalaris*, and the small house-fly, *F. canicularis*. After these flies have settled on soil or clothing contaminated with infected excreta, the living bacilli, clinging readily to the hairs on their feet, may be deposited wherever they settle next, often enough on a soldier's food. Actual experiment has shown that the bacilli of typhoid and dysentery can be recovered alive from the legs of some of the flies caught where an epidemic of these diseases is taking place.

Bacilli may also pass undamaged through the intestinal tract of the fly, and in the case of dysentery may remain alive there for four days. Infected droppings deposited on food may infect man. Shiga's dysentery bacillus in a virulent form has been found by Bahr in the lower part of the intestinal tract of a fly caught on the bed of a patient with dysentery of Shiga's type. Flies, too, are fond of regurgitating food when starting to feed afresh, and, though they generally suck up most of the regurgitated liquid, enough may be left behind to infect a man.

In yet another way flies may carry infection. Larvæ which have fed on infected material may produce imagines containing virulent organisms and their droppings may cause a fresh outbreak of disease.

Dysentery is of two main kinds, one, amoebic dysentery, caused by a protozoan, the *Entamoeba dysenteriae*, or *histolytica* as it is sometimes called, and the other by various allied species of bacteria, of which the

most important is Shiga's bacillus. The bacterial dysenteries are those which occur most freely in the temperate zones, and in the European wars of the past have been one of the greatest scourges. Shiga himself says, "Always a constant companion of war, it has been more fatal to armies than powder and shot."

In the wars of old, where no effort was made to secure sterile water or to camp on clean ground, an almost incredible proportion of an army was attacked rapidly and with a high mortality, since the treatments were as futile as the preventive measures. For instance, in the 17th century, the thigh bone of a hanged man calcined to whiteness and given in a red cordial was recommended.

Even in later wars, such as the American Civil War, the Federal troops lost more than 37,000 men from dysentery, or 30 per cent. of the total deaths. In the Franco-German War of 1870 there were over 38,000 cases with 2,300 deaths in the German Army, and in South Africa we had 38,000 cases with 1,300 deaths. In the first Balkan War, amongst the troops in Salonica, a vast proportion of officers and men suffered from dysentery, which luckily was of a mild type. Had a severe campaign been before the Greek Army, one can see how much their physical efficiency and morale might have been lowered, and how it might have made the difference between victory and defeat. How large a part flies have taken in the spread of these epidemics no one can say. The close connection between flies and dysentery is supported by the observation of Bahr, that nearly all epidemics in temperate and tropical regions alike coincide with the fly season. In support of this I noticed in the Balkan War the immediate falling off in the dysentery cases with the onset of colder weather, and coincident reduction in the number of flies.

The Japanese gave us the first great object lesson on the value of sanitation in war. In 1894 their war cost them 155,000 men disabled by dysentery; three suffered from disease to one from wounds, and for one who died of wounds four died of disease.

Against Russia 10 years later one died of disease to four of wounds.

What is true of dysentery is for the most part true of typhoid and paratyphoid fevers, both due to bacilli of somewhat similar characters.

Few will forget how much greater were the casualties from typhoid than from wounds in the Boer War. Sanitary precautions coupled with inoculation have done much to check typhoid in the west in this war, but much illness has been due to paratyphoid.

With regard to typhoid and dysentery we have only to look at the incidence of these two diseases in the western theatre of war and in the Dardanelles, and to compare the relative abundance of flies and of the two diseases themselves in these two areas to obtain an idea of how much the multitudes of flies in the Dardanelles has been responsible for the great frequency of these diseases in the eastern zone. Preventive measures by inoculation and sanitary precautions were as nearly as possible identical in both. The great difference was in the ubiquity of flies in the East and their relative scarcity in the West.

Of cholera I have less to say.

Fortunately it is not endemic in the western war area. I need only remind you of its terrible ravages in the past, and even as recently as in the two Balkan campaigns, in the first of which Turks and Bulgarians suffered enormous losses from it, and in the second of which the Bulgarian army lost very heavily. But for the anti-cholera inoculations and other measures taken by the Greeks a widespread and devastating epidemic might have been caused.

Even in this war the Austro-Hungarian forces have had cholera in their ranks, and we shall not know until the war is over how great its ravages have been.

If next summer we are operating in Macedonia we shall be operating in a country where flies are abundant in the warm weather, and where in all probability many cholera carriers still exist. We shall have there two of the most necessary factors for the rise of a great epidemic.

Plague lies nearer to the diseases which are invariably carried by insects. It is fairly certain that the starting point of an epidemic in man is a prior outbreak of plague in rats, and the virus is conveyed from rat to rat by fleas, and by fleas from rat to man. These insects infest the rats especially round their necks and shoulders, and by their bites cause bubonic plague of the glands, which drain the lymph from these areas, the glands of the neck and axillæ.

Fleas which have bitten infected rats may gain access to man, and biting him may cause an attack of bubonic plague. The old expression, "a mere flea-bite," in this connection is a terrible misnomer, for a mere flea-bite may be a mortal wound.

In the later stages of an epidemic plague sometimes attacks the lungs in a large percentage of cases, as in the great Manchurian outbreak, and pure pneumonic cases occur from which spread takes place directly by the air from man to man, and the flea loses its importance as a carrier of disease.

Nevertheless, but for the flea plague would probably cease to be a human ill. There are ample proofs, direct and indirect, that the flea is the carrier. Animals suspended in cages, out of the reach of the jump of a flea, can be exposed to plague with impunity, the controls within reach die.

The exact mode of infection, as our own member Mr. Bacot has shown, is that the insect becomes packed with plague bacilli in the anterior part of its alimentary canal, and as it strives, half-starved, to obtain a meal of blood, it regurgitates some into the skin of its host. The bacilli prevent it from filling its stomach, and so the Black Death may kill rat, flea and man in turn.

It is clear from this that only fleas, which bite both rats and man readily, are really dangerous, and though many fleas have been shown experimentally to be capable of conveying the infection, few really play an important part in the natural spread of the disease from animals to man.

Of the two rat fleas, *Xenopsylla cheopis* and *Ceratophyllus fasciatus*, the former is infinitely the more dangerous, for though both have a cosmopolitan distribution only the former bites man with avidity. Our

own flea, *Pulex irritans*, the mouse flea, *Ctenopsylla musculi*, and the dog flea, *Ctenocephalus canis*, can convey it, but seldom do so. Both the old black rat, *Mus rattus*, and the more enterprising grey one, *Mus decumanus*, the mouse, *Mus musculi*, and many other animals are liable to plague, but in Europe the common rat is the gravest danger.

Fortunately fleas seldom stray from their own host. Birds and beasts have their particular fleas, and some of these will on no account take human blood, though under stress of circumstances about half the bird and animal fleas of Europe will bite man. In the war no plague has occurred so far as I know in Europe, but we are operating near the endemic areas of the disease, and we are employing troops from the plague centres of India, so that it must not be left out of account. The devastating epidemics of 1349 and 1665 show that the climatal conditions of Northern Europe are no bar to its spread under favourable circumstances.

Despite this I think there is little to be feared from it. Our knowledge of its mode of spread should make it possible to check it before the more dangerous pneumonic cases have appeared.

Though rats are very numerous in some of the trenches, fleas do not seem to trouble the men much. *Pulex irritans* is uncommon even the Balkan armies, in spite of its abundance in the villages there, and rat fleas are probably still less numerous. It is only when armies are stationary for long periods in the field, or at the bases, that fleas have time to breed. Four to six weeks are required to produce a fresh generation. The larva living amongst rubbish, a thin worm-like object, and eating bits of solid organic debris is not a parasite.

The non-parasitic habit of the egg, larva, and pupa, makes the flea less dangerous than the louse to armies in the field.*

Another disease prevalent on the shores of the Mediterranean is "ponos." It is due to a small protozoan parasite, *Leishmania infantum*, and is primarily a disease of dogs. From them it is conveyed by the bite of the dog flea, *Ctenocephalus canis*, to young children. Fortunately adults are not affected, for the disease is a very fatal one.

Miliary Fever, or the Sweating Sickness, caused widespread epidemics between 1486 and 1551, and after a quiescent period of nearly 200 years reappeared in 1718, and spreading rapidly again caused outbreaks far and wide over northern Europe. It soon died down again and is now only met with quite locally in France and Italy. Marchoux and Haury, who have studied it in its present home, are convinced that it is conveyed to man by the bite of the fleas of field rodents. In view of its past history and former range over England, France, Flanders, Italy, Switzerland, Germany, Poland and Russia, its resurrection during the present war is not impossible. Its importance lies chiefly in the great number of its victims, for instance in Languedoc it attacked 30,000 people in 1782. The death-rate is generally quite low, five per cent., though it causes great prostration in those attacked, and the mortality has been as high as fifty per cent.

* Bubonic plague is reported to be devastating the Turkish armies in Asia Minor. February 1916.

Since fleas are degenerate flies which have lost their wings and adopted a parasitic habit, we see that Diptera are responsible for the spread of all the diseases in the group just dealt with.

In the next group, the diseases of war spread in no other way but by insects, first and foremost stands Typhus Fever, sometimes called Exanthematic typhus to distinguish it from Typhus abominale, or Typhoid.

It is a fever known through all ages as the accompaniment of war or of the famine which so often follows it. Few are the wars in which typhus has not exacted its toll of life.

War epidemics occurred in Italy in 1528-1530, in Germany in 1540, and in Hungary in 1566, where it was called the Morbus Hungaricus, and whence it spread over Austria, Bohemia, Germany, the Netherlands, and Italy, and only died down in 1568. All the wars of the 17th century were associated with outbreaks of typhus. In the Thirty Years' War it began in Germany and spread over great areas of Europe. In 1734 it attacked the Polish troops during the War of Succession. In the Seven Years' War it reappeared. In 1764 Spain suffered severely owing to its importation by the French forces. The worst pestilence of all in the 18th and 19th centuries was due to the wars of Napoleon.

With a more peaceful Europe typhus became less active, but we can well understand what would have happened in this great war but for our recently acquired knowledge of its mode of spread.

In Germany there have been outbreaks in prison camps, where prisoners, attendants, and doctors alike fell victims, but the sanitary measures adopted prevented its spread to other areas. In Austria, where less care was taken, severe typhus sprang up and was spread to Serbia by Austrian prisoners. All know of the terrible epidemic which afflicted that brave but backward nation, and which was only stamped out by our own medical authorities. The mortality was appalling, but I know no reasonably accurate figures of the sick and dead. Some idea may be gleaned from the fact that of 1000 Austrian prisoners at Uskub between 600 and 700 actually perished. Death carts passed along the streets twice a day, as in the old days of the plague in London. Until a very short time ago it was thought to be an air-borne disease. In Creighton's translation of Hirsch it is described as "Exquisitely contagious, diffused by air, and capable of clinging with great potency to articles of clothing." Study of an allied or identical fever in the Rocky Mountains, and an application of the knowledge gained there to ordinary typhus in Algeria and Ireland, led to the definite proof that it is conveyed from man to man by lice.

It is just possible that when the lungs are much affected it may become capable, like plague, of an air-borne carriage, but the evidence is against this.

The common body louse, *Pediculus vestimenti*, and probably the head louse too, *P. capitis*, convey the parasite to man.

Both these insects feed frequently, at least twice a day, by sucking the blood of their host, and near the place where they feed they often pass their excrement in a partially digested state. Thus virulent parasites may be transferred from the blood to the skin. Lice readily pass

from one individual to another, directly or indirectly, by means of articles of clothing or bedding. It is also suspected that the parasite of typhus may be handed on to a second generation of lice through the eggs of those which have bitten typhus patients. Under war conditions it is almost impossible to prevent men, and even officers, from becoming infested. The itching set up induces scratching, and through excoriations so produced the organisms in the excreta or in the remains of a crushed louse may enter the system and cause an attack of the fever.

Some consider this the only way in which infection takes place, others think it takes place by the actual skin puncture, and that this can occur is proved by the experimental conveyance of typhus to the macaque (*M. sinicus*) by the bite of the louse alone. Though apparently a small point it is of some practical importance in preventing the spread of the disease, and for a time had a great personal interest to me, namely, for the few days after I had been bitten by a louse from a typhus patient. Luckily the genera and species of lice, even more than those of fleas, are restricted to their own particular genera and species of animals, so that in lice-borne infections we do not need to trouble about animals as possible reservoirs of disease.

Adult lice die very soon, in two or three days, after removal from the warmth and food obtained from the human body, but the eggs are difficult to destroy. They hatch out over a period of about a month, and so there is a constant succession of young lice ready to grow and multiply if they can obtain access to a man's body. In the case of *P. capitis* the eggs are attached to the hair, but in *P. vestimenti* they are always laid on the clothing, a habit presumably necessitated when man lost his general coating of hair over the body and adopted clothing to replace it.

Lice, in addition to acting as carriers of typhus, also carry the Relapsing Fever of Europe, often called Bilious Typhoid by the older authors. This disease has frequently occurred in war in association with typhus, and was only clearly recognised as a separate disease by the discovery of its causal agent, in the form of a large and active spirochæte, *Spirochaeta recurrentis*, in the circulating blood. Its special tendency to occur with typhus is of course explained since we know now that both diseases are spread by lice.

In the case of the spirochæte the disease can only be introduced by scratching and so crushing an infected louse and introducing the parasite through some breach in the surface of the skin. All attempts to cause infection by the bite of the louse alone have proved ineffectual. But Conseil and Nicolle, and others, have demonstrated that in man and monkey it can readily be caused in the way just described; and this is an interesting point in view of the fact that accidental inoculation by blood containing spirochætes has occurred more than once during laboratory experiments, with an attack of relapsing fever as its result.

The Relapsing Fever of North Africa, due to the *Spirochaeta berbera*, is also transmitted by lice, but that of India, due to *S. carteri*, is carried by the bug *Cimex rotundatus*, and that of Uganda, of which the parasite is *S. duttoni*, by the tick *Ornithodoros*, and so is outside the scope of this

address. Clearly the European and North African fevers are those most likely to prove dangerous in the present war.

In addition to these well known scourges a new disease has been recognised in Flanders, Trench Fever, which produces pyrexia, often of a relapsing type. The disease is mild, but of considerable importance owing to the enormous number of its victims. Experiments upon soldiers suffering from slight injuries proved that the infection cannot be conveyed by blood serum, filtered or unfiltered, or by the filtrate of crushed corpuscles, but only by blood with intact corpuscles. The incubation period varies from six to 22 days. The parasite is probably intracorpuseular and minute, for no organism could be identified in the blood films. The disease has been almost entirely limited to soldiers in the trenches and men in the R.A.M.C. This fact, with others, make it almost certain that the parasite is conveyed by some insect, and its prevalence during the winter months makes it almost certain that the louse is its intermediate host.

Next to these diseases conveyed by lice we come to the most interesting of all, the protozoan diseases carried by various Diptera, and by these alone.

First comes malaria, of which Jones in his book, "Malaria and Greek History," says, "History contains many instances too numerous to discuss here, of disasters in war caused by malarial disease. There is little difference in this respect between malaria, enteric, typhus, plague and small-pox."

The different species of *Plasmodia*, *P. vivax*, of tertian ague, *P. malariae* of quartan, and *P. falciparum* of pernicious malaria, are conveyed by various species of mosquitoes of the genus *Anopheles*. As you probably know, the life-history of these species of protozoa consists of two distinct stages, the one passed in man the other in the mosquito. They are introduced in the saliva of the mosquito, as it bites, in the form of sporozoites. These enter the red blood cells of man, grow in size forming amoeboid trophozoites, and then divide into a number of small merozoites. These are set free into the circulation and cause an attack of fever, which is regularly periodical in tertian and quartan fevers, but irregular in pernicious malaria, where some trophozoites take longer than others to develop.

During the first part of an attack of malaria these free merozoites enter fresh corpuscles to form trophozoites, which multiply into merozoites again, and so on, until enormous numbers are produced. A change then takes place, and some form male and female sporonts, which circulate in the blood and are taken into the stomach of the female mosquito, when she feeds on man. In the mosquito gametes are formed and conjugation takes place. The zygote so produced pushes through the lining epithelium of the mosquito's stomach, and coming to rest beneath it grows enormously, splitting up finally into hundreds or thousands of sporozoites. These burst into the body cavity, and being actively motile find their way by the blood to the salivary gland and penetrate the secreting cells there, ready to enter man again when the mosquito feeds. This stage of development takes ten or twelve days, and the mosquito is not infective until that length of time after it has bitten a malarious individual.

In unfavourable circumstances female sporonts can live for years in the body of man without causing any symptoms, but change of climate or exposure to unwonted hardship stimulates them to multiply parthenogenetically and to produce a fresh attack of malaria. This fact accounts for much of the malaria amongst our men in this war, for many of the troops have come from India and other fever stricken countries to a colder climate. Other cases have been infected in the field. Much of Europe is still a malaria reserve, including Flanders, which is not far from the scene of the Walcheren Expedition of unhappy memory. Russia even as far north as Riga, parts of France, Italy, the valleys of the Vardar and other rivers of Greece and Serbia, Montenegro, Bulgaria, Albania, and the more tropical theatres of war, all have a population carrying malaria parasites and anophelines in which the sexual stage of these organisms can develop.

Closely allied to malaria are yellow fever, dengue and sand-fly fever, but their parasites are very minute, so minute that in one stage they can pass through a porcelain filter, which will stop any bacteria. Yellow fever requires for one stage of its life-history the mosquito *Stegomyia fasciatus*, but its geographical-range is such that it is most unlikely to appear in this war. Dengue requires a *Culex*, *C. fatigans* being the usual host, and as in malaria the mosquito is not infective for a period, seven or eight days, after biting a man suffering from the disease, during which it probably passes through a sexual stage. Dengue is a painful and prostrating malady, but is seldom fatal. Its chief importance in war is that it may attack almost every member of a population, and that in a brief space of time. Once in Havana half the inhabitants had dengue simultaneously.

In this war our troops in Egypt and the Near East are exposed to the risk of a catastrophe of this nature.

Very like dengue, but even milder, is sandfly fever, a disease with many synonyms, amongst which are three day fever and pappataci fever. It is widely spread in the countries bordering the Mediterranean; and in Serbia, where it is known as Uskub Fever, nearly everyone, military and civilian alike, was attacked last summer. It is conveyed by the bite of sand-fly, *Phlebotomus pappatasi*, a minute and silent insect, with a bite painful out of all proportion to its size. Mosquito nets are no protection against it as it can pass with ease through their meshes. The parasite of this fever takes seven or eight days to complete its development in the sandfly.

Of other insect-borne parasites, which may cause illness amongst our men in the more distant areas of conflict, such as the trypanosomes of sleeping-sickness carried by tsetse flies (*Glossina*), I must pass by. I must also pass by others of doubtful origin, such as Weil's disease or infectious jaundice, which has been prevalent amongst our men at the Dardanelles, and is suspected of being carried by some insect.

But let me in conclusion again point out that in nearly all great wars of the past three or four times as many men have been incapacitated by disease as by wounds, and three or four times as many killed, and that many of these diseases are carried wholly or partly by insects. Think of what our casualties would have been had the present war

been conducted in our former state of ignorance. And let us pay a tribute to the Bacteriologists and Entomologists who have unveiled the secrets of the lives of the parasites of these diseases and of their insect carriers, and to those who have applied their discoveries to preserve the health of our armies and so allow them to prosecute the war to a successful end.

THE BOTANY OF THE DISTRICT.

(Read March 2nd, 1915, by C. S. NICHOLSON, F.L.S.)

The position of our Society in the Metropolis places the field work in rather an anomalous position, seeing that London itself spreads out into all the home counties, and consequently our area embraces portions of four counties on the north of the Thames. Of these four counties vegetation is covered by three very well known county floras, those of Essex, Middlesex, and Hertfordshire. These three I have naturally referred to in order of date, Gibson's work on Essex dating from 1862, Trimen's on Middlesex from 1869, and Pryor's on Herts from 1887. As regards Middlesex, our district covers the whole county and, roughly speaking, one-third of Herts and Essex, whilst on the extreme west we take in a few outlying patches of Buckinghamshire, but so far as I can see these small patches may, for the purposes of our work, be regarded as forming part of Middlesex. The area as a whole is almost entirely confined to what is popularly known as the London basin, and the most casual glance at a geological map at once reveals the fact that so far as the superficial geology is concerned the area is practically covered by the London clay. On the north-western and northern limits we strike, however, that large section of the chalk, thereby entailing a change in the prevailing flora, and materially adding to the picturesqueness of the scenery. In the London clay area there are numerous outcrops of the Reading beds, these being most prominently noticeable around the district of Pinner and Northwood, whilst on the high grounds of Harrow, Hampstead and Highgate, we have numerous patches of the Bagshot sands, whilst brick earths and gravels occur in many places on the extreme west. Essex, so far as the portion which we deal with is concerned, is occupied almost entirely by the London clay; chalk, however, occurring near the Thames between Purfleet and Grays.

Considering our district as a whole it is well wooded, and the literature of the past reveals the fact that the large woods and forests of the present time form only an infinitesimal portion of their original size. In fact it is believed that in the early days both Middlesex and Essex were practically one huge forest.

In spite of the uniformity of the superficial geology the numerous woods and heaths with the gravels and sands help to relieve the monotony of the floristic features, but nevertheless a comparison of the three county floras shows a remarkable similarity, the comparative richness of Hertfordshire and Essex being almost entirely accounted for by the wide expanse of chalk and maritime situations respectively. This is

revealed by the accompanying table, which would form a perfect comparison if only Mr. Pryor had taken as his basis the fourth volume of Watson's "Cybele Britannica," but apparently in his case he followed another work instead of binding himself to Watson's work.

	Middlesex.	Herts.	Essex.	N.L.H.S.
British ..	465	495	507	514
English ..	300	299	337	152
All others ..	61	129	91	111
Total in Watson's Cybele	826	923	935	777
Total recorded ..	859		1070	

From the foregoing table you will notice that Hertfordshire shows 64 more species than Middlesex, whilst Essex is richer to the extent of 211. You must, however, bear in mind that these three floras embody the works of the earliest botanists, and many of their records are of antique interest only, so that when Trimen completed his work he admitted the fact that 58 species were in all probability extinct, as no worker had found them within recent years. This fact must not be overlooked when we consider the limited numbers of our records, seeing that we only record plants which have been known to maintain their position within the last fifteen years, and considering the restricted area of our chalk outcrops and the almost complete absence of maritime conditions, the only true comparison lies between our area and that of Middlesex.

Turning now to a consideration of the character of our flora, it will be noticed at once that it is typically British, the name attributed to Watson, who grouped under that heading such plants whose distribution was co-extensive with the British Isles, and revealed no marked differences, as between the three main sub-divisions of England, Scotland, and Wales. The English type naturally is the one most met with after the British, those necessarily being of a more southern type, and after that we get a somewhat large proportion, equivalent to one-seventh, representing the introduced species. You may have noticed the disproportionate number which we show of the English type of plant, but that at present I cannot satisfactorily account for. It arises from either one of two causes, viz., that Watson changed his opinion as his studies progressed, seeing that my analysis was derived from one of his earlier works dated 1835, whilst the authors whom I have consulted have based their division upon the fourth volume of his "Cybele Britannica," issued some time after 1852. This volume I unfortunately have never been able to obtain, although I possess all his other published works. If this be not the reason I attribute the disparity to the fact that the increase in drainage, the destruction of woods or their conversion into agricultural land, has brought about a change in the habitat, and naturally plants of a more southern type would be less fitted to adapt themselves to the new conditions than those plants which in the past had proved themselves capable of being equally fitted for such varying conditions as are found within our islands.

You may be surprised at the small number of the introduced plants, but in that connection I would state that I personally am somewhat opposed to recording mere casual appearances which are only represented by growths of one year, and which never succeed in reproducing themselves. I have already referred to the number of species which were believed to be extinct in Middlesex fifty years ago, and this number I fear must be increased by at least 79, seeing that none of our members have succeeded in finding any of the species which are recorded in the county flora, and are set out in the accompanying list. Even within our own time many well known localities have been lost, and in Highgate Woods, which thirty years ago were a blaze of colour in spring, are now so intersected by cinder and asphalt paths that their beauty has been almost destroyed. Blue bells are practically non-existent, and the thousands of wood anemones are now represented by a few miserable clumps of leaves here and there. The better drainage of the woods has destroyed numerous plants, and several fine clumps of such plants as *Carex pendula* and *Carex vesicaria* have been lost. Bishop's Wood, too, in Hampstead, is being rapidly spoiled, and within the last twenty years the famous alder copse at Whetstone has been converted into builder's land. The acquisition of Hampstead Heath for public use has now practically extinguished its interest as a botanical area, and I fear that Mr. Robbins may have the same lament to record when he deals with the eastern woodlands.

The probably extinct species in Middlesex are these:—

- | | |
|---|-------------------------------------|
| 22. <i>Aquilegia vulgaris</i> . | 411. <i>Sonchus palustris</i> . |
| 48. <i>Sisymbrium irio</i> . | 420. <i>Xanthium strumarium</i> . |
| 49. <i>sophia</i> . | 426. <i>Campanula rapunculus</i> . |
| 60. <i>Cochlearia anglica</i> . | 440. <i>Gentiana pneumonanthe</i> . |
| 84. <i>Dianthus prolifer</i> . | 445. <i>Cuscuta europaea</i> . |
| 85. <i>armeria</i> . | 449. <i>Cynoglossum montanum</i> . |
| 88. <i>Cucubalus bacciferus</i> . | 469. <i>Lathraea squamaria</i> . |
| 119. <i>Althaea officinalis</i> . | 482. <i>Scrophularia ehrharti</i> . |
| 128. <i>Hypericum elodes</i> . | 507. <i>Mentha pubescens</i> . |
| 165. <i>Trigonella ornithopodioides</i> . | 512. <i>gentilis</i> . |
| 168. <i>Trifolium ochroleucum</i> . | 514. <i>pulegium</i> . |
| 171. <i>scabrum</i> . | 543. <i>Utricularia vulgaris</i> . |
| 173. <i>glomeratum</i> . | 544. <i>minor</i> . |
| 188. <i>Lathyrus aphaca</i> . | 552. <i>Anagallis tenella</i> . |
| 226. <i>Mespilus germanica</i> . | 571. <i>Atriplex marina</i> . |
| 238. <i>Lythrum hyssopifolia</i> . | 574. <i>Rumex maritimus</i> . |
| 250. <i>Herniaria glabra</i> . | 613. <i>Salix pentandra</i> . |
| 251. <i>hirsuta</i> . | 630. <i>Myrica gale</i> . |
| 258. <i>Cotyledon umbilicus</i> . | 638. <i>Juniperus communis</i> . |
| 267. <i>Cicuta virosa</i> . | 645. <i>Orchis purpurea</i> . |
| 281. <i>Bupleurum rotundifolium</i> . | 646. <i>militaris</i> . |
| 295. <i>Tordylium maximum</i> . | 647. <i>ustulata</i> . |
| 319. <i>Galium anglicum</i> . | 650. <i>pyramidalis</i> . |
| 325. <i>Centranthus calcitrapa</i> . | 651. <i>Gymnadenia conopsea</i> . |
| 393. <i>Arnoseris pusilla</i> . | 654. <i>Ophrys apifera</i> . |
| 403. <i>Lactuca saligna</i> . | 667. <i>Leucium aestivum</i> . |

722. *Cyperus fuscus*.
 729. *Scirpus tabernaemontani*.
 731. *caespitosus*.

793. *Avena pubescens*.
 851. *Ceterach officinarum*.
 854. *Osmunda regalis*.

Not recorded by the Society as occurring in Middlesex:—

Myosurus minimus.
Ranunculus circinatus.
Ranunculus parviflorus.
Corydalis solida.
Fumaria capreolata.
Fumaria micrantha.
Turritis glabra.
Teesdalea nudicaulis.
Dianthus deltoides.
Sagina ciliata.
Sagina subulata.
Sagina nodosa.
Alsine tenuifolia.
Geranium rotundifolium.
Erodium moschatum.
Radiola millegrana.
Medicago denticulata.
Vicia lathyroides.
Spiraea filipendula.
Myriophyllum verticillatum.
Myriophyllum alternifolium.
Sedum dasycyllum.
Parnassia palustris.
Sium latifolium.
Bupleurum tenuissimum.
Oenanthe lachenalii.
Oenanthe silaifolia.
Archangelica officinalis.
Sambucus ebulus.
Valerianella carinata.
Scabiosa columbaria.
Inula helenium.
Pulicaria vulgaris.
Centaurea jacea.
Carduus pratensis.
Campanula trachelium.
Ouscuta trifolii.
Cynoglossum officinale.
Lithospermum officinale.
Myosotis repens.

Orobanche rapum.
Verbascum blattaria.
Antirrhinum majus.
Limosella aquatica.
Pedicularis palustris.
Mentha rotundifolia.
Mentha piperita.
Marrubium vulgare.
Centunculus minimus.
Samolus valerandi.
Littorella lacustris.
Paris quadrifolia.
Orchis incarnata.
Habenaria chlorantha.
Ophrys muscifera.
Spiranthes autumnalis.
Narcissus biflorus.
Tulipa sylvestris.
Fritillaria meleagris.
Allium oleraceum.
Colchicum autumnale.
Luzula forsteri.
Alisma ranunculoides.
Scirpus palustre.
Triglochin palustre.
Scirpus carinatus.
Blysmus compressus.
Carex pubicaris.
Carex disticha.
Carex divisa.
Carex strigosa.
Carex laevigata.
Avena fatua.
Koeleria cristata.
Schlerochloa distans.
Lastrea spinulosa.
Polystichum aculeatum.
Lycopodium clavatum.
Lycopodium imundatum.

THE FLORA OF EPPING FOREST.

(Read March 2nd, by R. W. ROBBINS.)

In E. N. Buxton's guide to the Forest there is a list of the flowering plants (including rushes, sedges, and grasses) found there, totalling about 436 species. With this list before him the author probably felt justified in his statement that "the Forest is, for its extent, particularly rich in its flora." Nevertheless, an examination of the list, and a comparison with the flora of, say, a Kentish woodland area, makes one hesitate to endorse Mr. Buxton's view.

The plants of any district are so intimately connected with the nature of the soil, that a brief consideration of the soils and geological formations of the Forest would lead one to expect a comparatively limited range of species. With the exception of a small capping of Bagshot sands in the neighbourhood of High Beach, the whole of the Forest lies on the London clay. There are, truly, considerable stretches of river gravels and sands in the higher parts, providing suitable ground for the sand and heath loving species, but the total lack of chalk, or even of chalky boulder clay, rules out at once that large class of plants to which a good supply of lime is essential, and, of course, the rock loving species are also absent.

The types of plant habitats within the Forest boundaries are soon enumerated. They are mainly three:—

(1) The damp woodland on clay, occupying the whole of the wooded area south of High Beach, and the stretch north of Epping known as the Lower Forest. The principal trees are oak and hornbeam, with an underwood of hawthorn, blackthorn, and much bramble.

(2) Dry woodland on sand and gravel—the wooded district between Fairmead Plain and Epping. The chief trees are beech and birch, and the undergrowth is comparatively sparse.

(3) Open heathy ground on the sand, interspersed throughout the dryer and more elevated ground.

Through the higher districts, where the tiny forest streams have cut down their beds to the underlying clay, marshy hollows are formed, clear of trees, and generally occupied by a luxuriant growth of rushes (chiefly *Juncus acutiflorus*), but holding also a few more interesting marsh species. In the heathy ground are a few damp places, not wet enough or extensive enough to hold the sweet gale, the bog asphodel, the marsh violet, or other peat bog plants so well known in the New Forest, but still providing a few stations for the handsome cross-leaved heath, and one or two for the sundew (*D. rotundifolia*). On the clay lands I only know one marsh large enough to deserve the name—a bog near the "Rising Sun," Walthamstow—but this bog contains, or did until recently, several species almost unknown elsewhere in the Forest—*Ranunculus hederaceus*, *Epilobium palustre*, *Veronica scutellata*, *Lythrum salicaria*, Cotton rush, and various other rushes and sedges. In some pools near by the frogbit, water violet, *Glyceria aquatica* and *Apium inundatum* flourish, and not far off, the Bladderwort (*Utricularia neglecta*), is found, so the southern end of the Forest, although so over-run, still contains some interesting species.

Since the proximity of London and the large number of visitors to the Forest has reduced almost to extinction the more conspicuous flowering plants, one would expect to find more of botanical interest among the sedges and grasses and the less accessible inhabitants of the marshes and pools, and this is certainly the case. The small forest ponds and their margins generally repay examination.

To return to Buxton's list. As the list was prepared with the assistance of Professor Boulger, there is no doubt that the species there given have at some time been observed in the Forest, so that the list has considerable historic interest. But it contains many plants of whose present existence in the Forest I have the gravest doubt. Of the 436 species, there are about 70 which are unknown there to me, either personally or by report. I mention a few in the hope of obtaining some further information :—

Teesdalia nudicaulis, *Parnassia palustris*, *Cerastium quaternellum* and *arvense*, *Saxifraga granulata*, both *Chrysosplenium*s, *Serratula tinctoria*, Dodder, Mullein, *Pedicularis palustris*, *Mentha pulegium*, Vervain, *Littorella lacustris*, Herb Paris, *Spiranthes autumnalis*, and Juniper.

On the other hand, I have a list of about 25 species I have observed myself, which are not included. Nine of these are rushes or grasses. One or two, like the Ragged Robin (*L. flos-cuculi*), are obvious oversights, but perhaps *Veronica scutellata*, *Valeriana dioica*, and *Limnanthemum peltatum* were never observed by Mr. Buxton's recorders.

One hesitates to say that species not recently found are now extinct in the Forest, especially if they are such as would naturally be looked for there. I have had several quite unexpected finds in recent years. About six years ago, with another member of the Society, I was in an out of the way corner of the wood, not far from Epping, when we were delighted to find in a moist glade a grand clump of the uncommon Marsh Fern (*Lastrea thelypteris*), whose creeping roots had covered quite a large area, throwing up, perhaps, hundreds of fronds. In the grassy sides of this glade the Marsh Valerian (*V. dioica*) was in flower, and about a hundred yards away we found a strong colony of the Bogbean. These three species were quite new to us in the Forest. Some years ago on an excursion of the Society, a small clump of Whortleberry was found on the high ground near the Wake Arms. I have never seen it since. Two stations for the Lily of the Valley are known to me, and probably to many other members. A plant of Solomon's Seal near Chingford was quite an unlooked for find. And not far from the Wake Arms two or three clumps of the strange Birds' nest Orchis still throw up their pale brown spikes year by year among the decaying beech leaves.

In the introduction to his list of British Plants, Mr. G. C. Druce, omitting certain large genera such as *Hieracia* and *Brambles*, which would throw out of proportion the total figures, divides our native species into groups. An examination of the Forest flora on these lines reveals some points of interest. Some groups, such as the Alpine and the Littoral, or salt loving, we should, of course, expect to be unrepresented. But a comparison with the totals of such groups as the woodland, heath and marsh series, which we should especially look

for in an area of this kind, will give a better idea of the poverty or richness of the Forest flora than a mere total of all species recorded.

For example, of the woodland or Sylvestral group, the largest division of our native flora—a fact which throws a light on the ancient condition of Britain as a wooded country—of this group of about 300 species, something like 120, or 40 per cent., are present in our Forest list. Not a large proportion, I think, when the area of the Forest, its favourable climatic situation, and its undoubted history of undisturbed primitive condition are taken into account. The comparatively small group of about 100 Ericetal plants have 30 or so representatives, and about the same percentage of the 250 marsh and bog plants—the Paludal group—are found. This seems quite a fair allowance, when the widespread range and varying climatic conditions of heath, marshes, and bogs in Britain, and the small area of these types of country in the Forest, are considered. In our Forest pools about 15 per cent. of the British Lacustral species have been found.

About 70 or 80 of the Forest records are species associated with meadow land, hedge-banks, and similar situations. For example, *Ranunculus bulbosus* and *acris*, Sweet Violet, Tufted Vetch, Agrimony, Yarrow, Daisy. These species are somewhat difficult to place in Mr. Druce's groups, and probably he includes some with his Sylvestral group, so that the proportion of woodland species might be slightly increased. Of plants whose growth seems dependent upon the operations of man, the weeds of cultivation and wayside plants, we should not expect a large proportion in a district like this, but there are about twenty per cent. of the British Agrestal and Viatical species in the Forest list. Nevertheless, although the species have doubtless occurred, they are individually few in numbers and practically entirely confined to the roadsides and small plots of cultivated ground within the Forest boundaries, or to ground formerly under cultivation—such as Chingford Plain. The common field thistle (*Cnicus arvensis*) forms a conspicuous border along the sides of the old trackway crossing Fairmead Plain, and on the site of Fairmead Lodge nettles still spring up.

The large group of aliens, now such a considerable feature in the flora about London and other large centres of population, is almost entirely absent from the Forest. Taking an "alien" to be a species which though now spontaneous, originated in Britain through human agency, it is of course probable that many of the group just referred to may be of alien origin. But they are the colonists who have found in their new home a congenial soil and climate, and have maintained themselves, with the assistance of cultivation, so long that the history of their introduction is not now traceable. Their obvious inability to hold their own in competition with the native flora of primitive unbroken ground like the Forest, is a strong presumption of their foreign origin, however. But among aliens of recent introduction we are unlikely to find many species of sufficient adaptability to secure their position. Those capable of colonisation have mostly gained their place long ago. Therefore, within the Forest area, where cultivation and disturbance of the soil have fortunately ceased, very few of the modern casuals are likely to survive their first year.

Among the undoubtedly native and widely spread Sylvestral and Ericetal species, there are a few so sparingly represented in the Forest flora that one imagines there must be some special reasons for their scarcity. In some cases the reason is obvious. There is a story, likely enough, that the Hazel was rooted out to prevent the disturbance of the King's deer by nutting parties from London. The proximity of London is also doubtless accountable for the disappearance of so striking a plant as the Foxglove, and the Primrose has almost met the same fate; though it must be remembered that the Primrose is a plant of damp woodland, and was probably always scarce in the main block of the Forest, between Fairmead plain and Epping. In the damp Lower Forest beyond Epping it is still plentiful enough. But the same cause can scarcely account for the almost total absence of the Woodruff, the Wood Spurge (*Euphorbia amygdaloides*)—which is common enough in Hainault a few miles away—the inconspicuous moisture-loving *Chrysosplenium*s, and the two woodland grasses, *Milium* and *Melica*. Again, why is the Purple Heather entirely confined to a few spots on the gravel near Snaresbrook. The sandy ground about High Beach and the Wake Arns would seem to be quite suitable for it. On all the expanse of heather and gorse clad common the parasitic Dodder is, so far as I am aware, quite absent. Even the little Germander Speedwell is remarkably scarce, and though its flowers are bright enough it is hardly likely to have been uprooted as has the Primrose. Is it possible that the nearness of London has reacted on some of these species through the pollution of the atmosphere, which is often only too evident? I think there is no doubt that the scarcity of lichens on the Forest trees is largely due to this cause.

I ought before closing these notes to mention a few of the most interesting species still to be found.

Drosera rotundifolia is scarce, but by no means extinct on moist peaty ground near the Wake Arns.

Hypericum elodes occurs in some of the northern bogs.

Limnanthemum peltatum, perhaps the rarest British species in the Forest, is well established in a large pool near Ambresbury Banks.

Rhamnus frangula is to be found near the Eagle Pond, Snaresbrook. *R. catharticus* near the Connaught Waters.

A few trees of *Pyrus torminalis* are scattered through the woodland.

Campanula hederacea, the delicate little Ivy-leaved Bellflower, is a western and northern species, but has an outlying station in the Forest between Theydon and Loughton, in damp grassy hollows, often associated with *Anagallis tenella*.

Utricularia neglecta and *Hottonia palustris* near Woodford have been mentioned.

Daphne laureola is still found (very sparingly) in thickets round Fairmead.

Neottia nidus-avis and *Convallaria majalis* have been referred to.

Epipactis media, the Helleborine, is another orchid common in the Lower Forest, and occasionally found elsewhere.

Ferns have doubtless shared the fate of the Primrose, but the following nine species, which I have found at one time or another,

prove that Epping Forest was formerly, like any other woodland, well supplied with ferns:

Polypodium vulgare, *Lastrea filix-mas*, *thylypteris*, *oreopteris*, *dilatata* and *spinulosa*, *Blechnum spicant*, *Ophioglossum vulgare*, and, of course, the Bracken (*Pteris aquilina*).

A HAWTHORN HEDGE IN MIDDLESEX.

(Read May 18th, by ALFRED SICH, F.E.S.)

"A thing of beauty is a joy for ever," so wrote John Keats, in the opening line of his "Endymion." A hawthorn hedge, in perhaps the most lovely and enjoyable time of year—when the may is out, is a thing of beauty, dear to the naturalist and even to the ordinary individual, especially if he be a dweller of the wilderness of bricks and mortar. It is not, however, only when the may is out that the hawthorn hedge is attractive to the naturalist. In every month of the year, even in winter, we may, by diligent search, find something worth attention.

All hedges, whether of hawthorn, holly, hornbeam, beech, elm, or privet, have their own little world of inhabitants, but perhaps the world of the hawthorn hedge is larger and more varied than that of any other. The most perfect hedge from an entomological point of view is a mixed hedge containing, among other plants, hawthorn, hazel, honeysuckle, blackthorn, bramble, oak, elm, ash, maple, and dog-rose. It should not be too tall, but should stand on a bank with a ditch on the more shady side but only a bank on the sunnier side. Under the hedge on the shady side should grow tall grasses with patches of nettles, ground ivy (*Nepeta*) and other so-called weeds. On the sunny side bindweed, Jack by the Hedge, star wort, mouse ear chick weed, should adorn the bank as well as patches of clover and sorrel. A hedge such as this will provide food and shelter for countless numbers of insects, not to mention other living things. I do not mean this as a mere stereotyped expression, for who could count even the leaves mined by *Nepticulas*, *Lithacollitis*, etc., contained in one hedge, not to mention all the other inhabitants.

In our gardens we have spent time and thought on pergolas and rockgardens, why not plant an ideal country hedge? There might be an old fashioned stile in it, and its banks might be adorned with primroses and violets and arums, and in the ditch there might be kingcups and flowering rush. The hedges of England form a most beautiful feature of the country, and it is a great cause of regret that in these days of severe competition so many hedges have been grubbed up. The iron rails which are mostly used in place of the hedge are of no interest to the naturalist. It may be that the farmer will also lose by the change of hedges to rails, as the rails form no nesting places for insectivorous birds or shrew mice. It is a melancholy sight also to see a hedge the banks of which are overrun by fowls from the neighbouring cottages. They scratch the banks almost bare and destroy most of the insect life.

As to the age of the particular hedge which forms the subject of this paper, I can give no definite reply. Hedges appear to be something like rivers, they may be said to go on for ever. When one part gets old and decayed it is cut out and new plants are put in, and so, though no part of hedge may be more than one hundred years old, the hedge as a whole may be of far greater antiquity. Its inhabitants, though now feeding on growth of say five years old, may have descended from ancestors who fed on the same hedge in the days of good Queen Bess. This hedge was probably one hundred years old at least, and possibly very much older. It was situated in the parish of Chiswick in the southern part of the county of Middlesex, in latitude $51^{\circ} 29'$ North and longitude $0^{\circ} 15'$ West of the Meridian of Greenwich, or thereabouts, as the lawyers say. It stood near the river Thames at an elevation of about 28 feet above the sea, so that at exceptionally high tides the river water rose to a point not very far below the roots of the hedge, but there was a small meadow and a considerable stretch of market garden ground between the hedge and the river. The hedge stood on a patch of what is known as brick earth, which in some places overlies the gravel of the valley drifts of post pliocene age. The average rainfall would be about 25 inches, and the average temperature for the year about 49° Fahrenheit. The lowest temperature recorded for Chiswick was 4.5° below zero, in the year 1838, when the hedge was most certainly in existence, and the highest temperature was 97° in the shade. The hedge ran very nearly due east to west. It was about half a mile long, and was well sheltered from the north by a beautiful old ivy crowned wall and by trees above the wall. To the south it was open to the rays of the sun in fine weather, and to the south and west winds in rough days. At the foot of the wall was a path, and between this path and the hedge a road known as Burlington Lane. At one place a tidal ditch, from the Thames, overhung with alders and black poplars, ran through the hedge and in a culvert under the road into a lake in the grounds of Chiswick House.

On the bank of this ditch rose a very fine Lombardy poplar. Across the road opposite the poplar was a large crack willow, and on the wall beneath it *Catocala nupta* might often be seen, during the first fortnight of September, hiding just below the stone coping. A few weeks earlier *Bryophila perla* frequented the same wall. These were mostly of a rather grey tint. Years ago the ivy, which then grew luxuriantly on the top of the wall, afforded with its attendant *Nymphalids* a most beautiful sight. It must have been, I think, the autumn of that hot year, 1868, when these butterflies were in swarms. *Pyrausta atalanta* and its congener *P. cardui*, with *Aglais urticae* were most numerous, while *Vanessa io* haunted the blossoms in lesser numbers. Of late years, though *P. atalanta* may be occasionally seen, the sweets of the ivy are mostly consumed during the day by blow flies and *Eristalis tenax*. At another place, just within the wall, is still a fine stretch of lilac bushes that fill the lane with scent when the blossoms are out. Here *Celastrina argiolus* may be seen flying over the blossoms. It is this habit of flying high that seems to separate *Celastrina argiolus* from all our other blues. They are all ground blues and their larvæ feed on low

plants, while that of the Holly Blue feeds on shrubs. Very occasionally a more brilliant butterfly, the male of *Gonepteryx rhamni*, might be seen hurrying over the lane. These always appeared to come from the south, possibly from the buckthorn bushes on Wimbledon Common or Combe Wood. In the meadows behind the hedge *Epinephele jurtina* flew, and in the great year, 1877, the entomological world of Chiswick was startled by the appearance of *Colias adusa* flashing its orange pinions over the fields. These butterflies have not much to do with the hedge itself, but they have so far added to its surroundings by flying over the top of it.

For the same reason the Kestrel, carrion crow, black headed gull and a larger kind, probably the herring gull, may be mentioned as well as the herons, which sometimes appear high up sailing under the evening sky. While I have been searching the hedge my ear has been gladdened by the songs of the following birds: blackbird, song thrush, chaffinch, greenfinch, wren, willow wren, and nightingale, but the last not since 1893. The note of the cuckoo adds a great charm to a spring morning, about the 19th April was the usual time when the bird was first heard in this locality. Above the meadow on a fine day the lark might sing at almost any time of the year. In the evening two kinds of bats chased the insects, the large noctule flying high and the pipistrelle nearer the ground. The barn owl nested some years not far off, but was more often heard than seen. The sheltered corner of the meadow was a rather favourite haunt of the swallow, and perhaps I may mention here that there was a certain swallow's nest on a rafter at Chiswick, which was under almost daily observation for many years, and we used to note the day every spring on which the birds returned. The earliest date of return was on 17th April, 1888, and the latest 12th May, 1880. The winter of 1879-1880 was very long and severe. Only three quadrupeds were noticed. The pretty, rather long-eared wood mouse, *Mus sylvaticus*; the field mole, *Microtus agrestis*; and the common shrew, *Sorex araneus*. The last was most often seen dead.

The common frog and the common toad knew the hedge as a good hunting ground, but there seems to be nothing particular to say about either, except perhaps, that the former, owing to its more active habits, was more in evidence. There were several species of Mollusca, the largest noted being *Helix aspersa*, the garden snail. It has often a handsome shell, but in that part of Middlesex nearest London the shell is often corroded and looks shabby. I call it the "over and over" snail, because it is that "kind of snail which when people find them in their gardens they always throw them over the wall into their neighbour's garden, and when he finds them, of course, they come back again." Among the nettles at the foot, or sometimes on the hawthorn stems in the centre of the hedge, that brightly coloured snail *H. hortensis* might be seen. The type with fine black bands and the variety *lutea* with a bright yellow shell were the most common forms. *Helix rufescens*, Pennant, although curiously enough we know this is not its right name, I am not sure yet if we know what name it ought to have. All conchologists, however, know the species by this designation. This snail, together with *Hyalina*

cellarius and *H. nitidulus*, occurred under any half brick, chunk of paving stone, or even remnant of tin box that had been lying undisturbed for a time below the hedge, and in such situations the blackish slugs, *Arion hortensis*, with its orange foot sole, and *A. circumflexus*, with its white foot sole, might also be found. The most common slug, however, in these hiding places, was the little ochreous or pinkish-grey, *Agriolimax agrestis*. It might also be noted at sundown crawling over the weeds. *Helix pulchella*, when found in autumn on the wet moss on the hedge bank, was a most beautiful object under a lense. It has a glassy white shell, and the animal is also shining white when covered with dew, the whole creature looking like a living crystal. It was when hunting on the bank one morning that I found among the moss a fine specimen of *Miselia oxyacanthae*. This handsome moth was always common in the neighbourhood, as some old collectors used to call it the Glory of Ealing. One snail must not be forgotten, that is *Helix cantiana*. It used to haunt the western end of the hedge. Several might be seen on damp days among the herbage. Their shells, evidently from the absence of lime in the soil, were very thin, and more translucent than those of the same species from the chalk districts.

The lepidoptera are so intimately connected with the plants that both may be taken together. First of all, the whitehorn itself, that formed the larger proportion of the hedge, belonged to the sub-species with deeply cut leaves and pubescent peduncle, known as *Crataegus oxyacantha*, L., sub-species *C. monogyna*, Jacq. It is the common form in the Middlesex hedges, and in this hedge supported over twenty-five species of lepidoptera. The first of these to appear was the larva of that illusive species, *Coleophora trigiminella*. As soon as the buds burst, say towards the end of March, it might be seen having its breakfast after its long winter sleep. It lives in a reddish-brown case with the mouth bent down nearly at a right angle. If we do not see it quite early in spring there is little chance of finding it later. It escaped the notice of entomologists altogether till 1881, and was not recognised in England till 1906.

Very early in April some very small grey moths used to fly over the hedge in the afternoon sunshine. They were delicate fairy-like beings. The uninitiated might have taken them for gnats, but they were *Ornis anglicella*. In May and June the caterpillars live in little tents made by folding down a lobe of the hawthorn leaf. The moths again appear in July and August, and the tents may also be found in September. In May a bright ochreous moth with sharply marked white wedges on its forewings sat on the leaves or fluttered softly over them. This was *Lithocolletis oxyacanthae*. It looks like a microscopic piece of tessellated pavement, but it requires a lense to see its beauty. The larva lives in a chamber between the cuticles of a hawthorn leaf. There are two broods in the year, and the larvae that feed up in the autumn pass the winter inside the dead leaves that fall to the foot of the hedge. The winds may carry the leaves long distances, and if all goes well the beautiful little traveller will appear in spring none the worse for his long voyage. One other *Lithocolletis*, called inappropri-

ately *corylifoliella*, was also abundant on the hedge. This has orange wings with white and black lines; it is a little fairy thing like its congener. It differs, however, in one particular, and that is that its larva mines the upperside of the leaf instead of the underside. This genus is very rich in species, and is attached to a great variety of plants. Most of the larvæ mine the underside of the leaves, but a few the upperside. They are very constant in their manner of mining. In May two other leaf miners occurred on the hedge. One of them common to most hawthorn hedges, *Coleophora nigricella*, lives during the winter in a minute dark, somewhat boat-shaped case, and in spring makes small pale patches in the leaves and then fastens its case, which it has now outgrown to a leaf, and mines out an elongate space. It afterwards cuts out a new straight case, composed of the two cuticles of the leaf fastened together with silk. It then continues moving from leaf to leaf eating out patches between the cuticles. When full-grown it fastens its case, now become the cocoon, firmly to the upper surface of a leaf. In July the small narrow winged, very dark moth appears. The other species, *Coleophora hemerobiella*, is much larger and very much more local in its distribution. Its habits are much the same, but its winter case is wrinkled and curved in a semi-circle. It makes large brown patches in the leaves, and when full grown attaches its long straight case to a hawthorn twig, where it stands out at a right angle. In July the dark grey moth with a dark spot towards the tip of the wing sits on the leaves during the day, and flies softly about the hedge at dusk. These two moths, in common with all the Coleophorids, carry their antennæ stretched out straight in front of the head when at rest.

In May a dark grey moth with rather coppery tips to the wings flitted along the hedge in the sunshine. This was *Svammerdamnia pyrella*. The yellow and red-brown larva lives in a web stretched over a leaf, and nibbles the cuticle and parenchyma, making a kind of lattice work on the surface. There are two broods, but the moth appears to be more often observed in spring and the larva more abundant in autumn. A larger species of this genus, *S. lutea*, with a dark band across the forewing, occurred more sparingly on the hedge in July. With regard to the insect most in evidence in a hawthorn hedge, I would give the palm to the small ermine, *Hyponomeuta padellus*. In May and June the larvæ, dark grey with black spots, live gregariously in a common web which may be seen from a distance. The white silken cocoons may be found in the web, and the moths with whitish forewings with numerous small black dots are very common in July and August. They are rather sluggish in their habits. A moth of an opposite colour and nature used to occur in the hedge in May. It is black with an orange head, very lively, and known as *Spularia aurifrontella*. It flies briskly in the sunshine. There is also one other lively black moth, *Blastodacna hellerella*. This has a slender white line running obliquely across the forewings. The larva lives in the berries of hawthorn, spinning two or more together. A third and beautiful black moth with a broad white band, *Recurvaria leucatella*, was very rare. I think I only saw it once in this hedge. It

feeds on whitethorn as does also the larva of *Teleia vulgeta*, a dark grey moth with a conspicuous black mark across the forewing. This was no rarity in July.

There is one little moth common to most hawthorn hedges, which is easily recognised if we see it at rest. *Argyresthia nitidella* sits on its head on a leaf with its body elevated. It is really amusing to watch how carefully this little brown and white moth will balance its body when bringing its white head down to the leaf. The larva feeds in the shoots early in the year. There is one more *Coleophora* which ought to be mentioned on account of its case, from which it takes its name, *siccifolia*. The brown moth which flies in June is seldom seen, and the same observation is true of the case unless special search be made for it. The larva makes three cases, all of similar construction, but differing in size, out of hawthorn leaves. The final case is formed about the month of August by mining an elongate patch in the upper part of a leaf, then rolling the margin of the leaf over the mine, and finally cutting off the entire upper portion so that the larva walks off with the apical third of the leaf. It has the appearance of carrying too much sail, and was called at one time the clumsy tailor. It is, however, to my mind a very clever case. It is attached to a twig all through the winter, looking merely like a bit of dead leaf, and it does perhaps deceive even the sharp eyes of tits and wrens. Perhaps in looking along a hawthorn hedge in August or September, you may have noticed some round brown patches in the leaves. In some years they are very numerous. This is the way that the larva of *Cemistoma scitella* mine. The minute larva when full grown may be recognised easily by the peculiar way in which tubercle iv. on the methathorax, 1st and 2nd abdominal segments, is elongated. The moth appears in June and is very beautiful. It is grey with orange marks, and is adorned with a large velvet eye spot containing a rosy metallic pupil. Before leaving our friend the hawthorn two tortricids should be mentioned. *Cnephasia nubilana*, which was noticed sparingly, till one year when it was abundant. One afternoon there were fifty or more flitting over one spot in the hedge, where there was doubtless a lady of attraction. Since that day I do not remember seeing another specimen in the hedge. That quiet and interesting species, *Acala variegana*, used to sit on the leaves in late summer. The form with a white base clouded with brown and apical half brown, and the blackish-purple form, known as *cirrana*, were commonly seen, but the form *asperana*, in which the basal half is white and the apical half blackish, was decidedly rare.

The macrolepidoptera were not very much in evidence. *Camptogramma bilineata*, *Opisthograptis luteolata*, and *Acidalia aversata* might be induced to take wing by aid of the walking stick. The stately larva of *Sphinx ligustri* would occasionally, quite by chance, become visible and compel our admiration as it rested on a branch of privet, of which there was a good deal in the hedge. In this hedge I never found this larva on ash, but the slender *Gracilaria syringella* used to attack both privet and ash as well as the lilacs across the road. In July the reddish-brown tortrix, *Cacoecia unifasciana*, could always be seen flying

about the privet. It was one of the more abundant species at the eastern end of the hedge, and remained on the wing so long that the last individuals seen were generally so worn as to be hardly recognisable. The brightly coloured hairy larva of *Porthesia similis*, with its warning lines of red, loved to eat the hawthorn leaves in the sunshine, but I always avoided touching it on account of its stinging qualities. Another hairy caterpillar was that of *Orgyia antiqua*, with its tufts of hairs, this also liked the top of the hedge. In late summer the full grown larva *Acronyeta psi*, with its broad pale yellow dorsal stripe, was no rarity. In April I once found the larva of *Urapteryx sambucata* on the ivy in the middle of the hedge. I fancy they were there every year, but they are easily passed over. I never found them on elder in spite of the name. In May the white and grey *Cilia glauca* might sometimes be seen sitting on a leaf; its curious dark brown larva always seemed to prefer the ends of the shoots where the leaves were more tender. A few plants of *Malva rotundifolia* adorned the bank with their pale lilac flowers, and on this the lovely soft green larva of *Ortholitha cervinata* occurred.

Lamium album and *L. purpureum*, of course, grew about the hedge, and the latter was often one of the first plants to bloom in the early spring. It would keep pace with the groundsel, growing at the foot of the wall opposite, where the small red bees would be darting about in the sunshine. Two other labiates grew under the edge, and to each there was attached a coleophorid. *Ballota nigra* grew in a clump with its soft greyish-green leaves. In spring some of the leaves would have conspicuous pale patches on them, and by lifting up those thus marked the hairy case of *Coleophora lineolea* would be seen, hanging from the under surface. It was quite easy to find these cases, but much less easy to discover those of *Coleophora albitarsella* on *Nepeta glechoma*. This little plant with its purple blossoms would thrust its flowering spikes towards the sunshine, but there would be a good deal of it growing hidden away among the nettles, and it was usually to the hidden parts that the long dark cases were attached. I have taken many of them, but I believe only on one occasion without stinging my fingers with the nettles. The nettles themselves harboured a few *Eurhyncha urticata*, and numbers of *Simaethis fabriciana* might be seen hovering over the tops of them. There was a fair amount of bramble in the hedge. I will not venture to decide to which of the particular sub-species it might have belonged. It was, however, the food plant of perhaps the most brilliant moth of the whole hedgerow. Some of the leaves remained green throughout the winter, and in some of them might be seen at any time of the year the long gallery mines of *Nepticula aurella*. This minute gem is as gorgeous as a humming-bird. The forewings appear purple with a metallic golden band and very dark apex. Another miner also common in bramble leaves is *Tischeria marginata*. Its larva instead of making a long gallery, forms a short mine starting from a point where the egg was laid, and then widening out till it comes to a rather abrupt termination, something like a cornucopia. The little moth with yellow wings bordered with dusky brown may be seen sitting on the leaves.

In the hedge there were several pieces of elm, *Ulmus campestris*, and in the leaves of this two interesting *Nepticula* larvæ mined. *N. marginella* is a handsome moth, the base of the forewings being brassy golden, then follows a silver metallic band set off by the black apex. It takes its name from the larval mine, which is long and runs very close to the edge, and even into the serrations of the leaf. The other species, *N. viscerella*, is still smaller and very dark brown without markings. It also takes its name from the mine which occupies a small space and is closely bent and folded on itself. There were two tall climbers in the hedge, one *Tamus communis*, was remarkable for the graceful shape and glossiness of its leaves, and the other, *Calystegia sepium*, for its lovely white flowers. The smaller *Convolvulus arvensis*, with its pink and white blossoms was also present. The two last mentioned afford nourishment to the little hairy larvæ of *Alucita pentadactyla*, the white plume, certainly one of the most exquisite of our native lepidoptera. I have verbal testimony that this delicate moth was an inhabitant of the hedge seventy years ago. A very interesting species, *Bedellia somnulentella*, mines the leaves of both the greater and lesser convolvulus. The prettily marked larva, though mining right into the leaves, moves freely from one leaf to another, and the pupa is of peculiar shape and exposed without a cocoon, reminding one of a *Pierid* pupa. It did not occur every year, but when it did there were generally several specimens. The moth is dark grey with darker speckles. In the late afternoon in May, *Elachista rufocinerea*, a little whitish moth marked with ochreous brown, might be seen flying along the hedgerow. The larva mines the leaves of grasses, of which there were *Holcus mollis*, *Dactylus glomeratus*, *Brachypodium sylvaticum*, growing at the foot of the hedge as well as in the meadow with many others. Among these *Alopecurus geniculatus* and *Trisetum flavescens* may be mentioned.

Towards the western end of the hedge there was a piece of market garden ground, and on the borders of this, *Chenopodium album* was a common weed. At least three species of lepidoptera were attached to this. The larvæ of *Lita atriplicella* used to feed between leaves which they spun together. Those of *Chrysopora hermannella* mined the leaves in broad green galleries sometimes forming blotches, while *C. stipella* var. *naeviferella* made circular white mines often in the same individual plant. *C. hermannella* is a singularly handsome moth, being black and red with silvery markings. The other is very dark with yellow spots. In later years, to prevent the animals straying, the meadow behind the hedge was enclosed by strands of barbed wire. These were mostly fastened to posts made of the stems of old plum trees. In these posts from June to March the elongate grey larvæ of *Dasycera sulphurella* used to live. In dull weather in May the dark moths with yellow marks on the forewings might be seen sitting on the posts, but on sunny days they would fly freely, then showing their yellow hindwings.

Life in this hedge could not always have been passed in a bed of roses. There was certainly severe competition. I remember finding on one occasion a Coleophorid, a Lithocolletis, and a Nepticula, all

mining the same small hawthorn leaf. The first mentioned, of course, could easily move off to another leaf, but the other two depended on that one leaf for their existence. In the spring and early summer the aspect appeared more peaceful. There were the birds, of course, and ichneumons, but except *Salticus* the spiders and the hemiptera were then all so small that they were scarcely in evidence. As the summer advanced the hemiptera grew larger and more formidable, and in September in some years nearly the whole hedge was covered with the webs of spiders. It seemed a puzzle how any small moths or diptera could fly in and out of the hedge without being captured, and yet one might see *Acalla variegana* sitting in peace and comfort on the leaves, or *Lita costella* flitting about the leaves of *Solanum dulcamara*. Under these conditions it is probably a case where ignorance is bliss. The lives of these little beings are so short, and experience of danger is generally so fatal to them, that I fancy they live most of their imaginal life, at least, in paradise. It is true that many insects are apparently so timid that even a shadow will frighten them, but I think that all the while they are left in peace, they enjoy their lives without the slightest thought of danger. (I do not think it possible that a larva, for instance, could think to himself in the morning: "Had another good night. No marauding beetle disturbed my slumbers, and I hope there will be no ichneumon attacks to-day!")

In conclusion, I will attempt to describe the hedge firstly on a December afternoon, and secondly on a May morning.

A DECEMBER AFTERNOON.

Everything is perfectly still, there is not a breath of wind, the soft mild air seems laden with moisture. The herbage at the foot of the hedge lies discoloured and stricken. The hedge itself is stiff and prickly and bare, except a few brown leaves that still cling on. In the dull half light of the winter afternoon we might imagine that life had forever departed from the hedge, that never again would it burst into leaf and team with insects. But life is there even in December. As we approach the hedge some small flies rise up and vanish in the still air. Here on a twig just above a bud is a minute black case, inside is the living larva of *Coleophora nigricella*, and not far off is a wrinkled curved case. That is the shelter in which *Coleophora hemerobiella* passes the winter. On another larger twig we see a small brown dome. This is the tent that covers a batch of *Hyponomeuta padellus* larvæ. In August the moth had laid a batch of eggs, one partly over the other like the tiles of a roof. In a week or two these eggs hatch, and the larvæ remaining beneath the empty egg shells spin them firmly to the bark of the twig and sleep snugly beneath this roof till winter is over. If lucky enough, we may even see a blue-grey moth with its wings partly folded round a twig. This would be *Exapate congelatella*, which for some reason chooses December for the month of its appearance. Among the fallen leaves at the foot of the hedge are many containing pupæ of the genus, *Lithocolletis*. So that even in the dullest time of the year we may find something of interest in the hedge. Nor must we forget that the descendants of most of the

myriad creatures that haunted the hedge in summer are hidden somewhere about the hedge in winter in one stage of life or another.

A MAY MORNING.

Last night there was just a touch of rain which sweetened the air and took the dust off the leaves. To-day the sun is hot and the hedge is a mass of fresh green leaves, enlivened here and there by the young red shoots, while on the top are some sprays of white blossom which scent the air. Here is the chaffinch singing, and from the distance comes the note of the cuckoo. Two or three swallows are skimming over the meadow, *Pieris napi* flutters by, and as we look up we catch sight of *Celastrina argiolus*. Presently something very small flies quietly over the leaves, and when it settles we recognise *Lithocolletis oxyacanthæ*, and further on we find *L. corylifoliella* at rest on a leaf. We shall probably see several more of each of these quiet moths if we look for them. Then there are some little very dark moths with orange-brown tips to their forewings sporting over the hedge: they are tortrices, *Pamene rhediella*. Here on a leaf is the larva of *Coleophora nigricella*, hard at work cutting out a new case. Down below *C. lineolea* is on the margin of a leaf of black horehound adding a portion to its old case. Then we see *Swammerdamia pyrella* merrily flying along in the sunshine in and out among the leaves, and as we look along the hedge we see many of them apparently seeking their lady-loves. Here quietly resting on a bramble leaf is *Tischeria marginæa*, and above on a hawthorn leaf is a whitish patch. This, on closer inspection, we find to be *Cilix glaucata*; quite a giant compared with the smaller tineids. There on the top of the hedge is the gay larva of *Porthesia similis*. Here round a post are two or three moths flitting about, and by the amount of yellow visible we know them to be *Dasycera sulphurella*. There is a shoot of hawthorn with a fine thick web spun over it. Inside we see the little pale ochreous larvæ of *Hyponomeuta padella*. As we sit on the stile looking along the top of the hedge and getting a foreshortened view, we can see scores of winged fairy things in the acme of enjoyment. The morning that we have been longing for all through the winter has come at last, and it is so beautiful, and our old friend the hedge is so full of life that we are loth to leave it. As we turn away the last thing we see is the gallant little *S. pyrella*, still flying in and out of the hawthorn leaves.

THE TREATMENT OF NATURE IN ENGLISH GOTHIC DESIGN.

(Read June 1st, 1915, by Miss F. BAGUST.)

The English designers of the Gothic period did not revel in the reproduction of natural forms to anything like the same extent as the Oriental races, as far as we can tell from the few rare examples of early Asiatic art now extant.

Yet for many reasons perhaps it is just as well that the somewhat severe and reserved temperament of the English is generally apparent in the work of the Middle Ages, for it imparts to architectural ornament

a dignity and majesty which cannot be obtained when a freer interpretation of plant-life exists. To appreciate fully Gothic foliage at its best, one must study its evolution through Saxon and Norman times, see how it was influenced by the work of other nations, and watch the interesting experiments of the 12th century artists as they slowly felt their way towards something peculiarly characteristic of our island race, an art, typically English, without any continental flavour about it. It took over one hundred years to perfect this style, and even in the thirteenth century we still find the springtide of natural forms, when there was plenty of stalk, but the leaves were small and undeveloped, and the flowers were only budding.

Yet as the spring is to many people the most beautiful and invigorating of all the seasons, so is the work of this time to most lovers of archeology; there is a freshness and fascination about this early Gothic work that appeals to the heart far more than many examples more matured, and more magnificent.

Although one turns to architectural ornament as the chief expression of the artist's skill, it is unwise to pass over the minor crafts, such as ironwork, illuminated manuscripts, embroidery, and the like, for without them we cannot properly estimate the use of natural forms in design, and a one-sided impression of the subject is left upon the brain.

The thirteenth century is the great period for Gothic art. The designers then treated nature in the best possible way, not imitating her, but taking what was best for their purpose, conventionalizing the flowers and foliage enough to prevent any one from thinking they were endeavouring to outrival God's handiwork.

Lincoln, Wells, and Salisbury all possess grand specimens of a particular kind of foliage, that generally known as "stiff-leaved," but the term is as inappropriate as any can be, "wind-tossed" would be much better, for the leaves do suggest by their freedom of arrangement that they are blown about by a passing breeze. The stalks are so designed that they spring up from the necking of the capital as if it were the earth that nourished them, while the leaves fall over naturally, and gracefully, there is no servile imitation, but a strong and sturdy adaptation to serve a special purpose.

As the thirteenth century wore away, there crept in gradually a slight tendency to copy nature more closely, a greater variety of plants can be recognised, some of the favourites being the vine, oak, and maple.

A strong likeness to a certain little fern that grows in the crannies of old walls, can also be found among much carving, stained glass, and illuminated manuscripts, and it is not wonderful that the beauty of this tiny plant should suggest to the designer, a suitable subject for his brush or chisel.

The late thirteenth and fourteenth centuries are fuller of interest to the student of natural history than any other. The designers simply revelled in imitating nature, and certainly their skill in carving has seldom been surpassed. The Chapter House at Southwell, which dates from about 1280, contains some of the very finest specimens of

naturalistic foliage in England. Every capital and spandril is of a different design, and quite a number of plants are represented, among them being the vine, hawthorn, and hop. The undercutting is marvellous, and every part is most carefully finished, whether seen or not.

The treatment of the foliage at Southwell is close on realism, yet the designer shows a certain amount of discretion, and each part is well planned, and spaced.

Only a few years later than the work at Southwell, is the wonderful shrine of St. Frideswide in Oxford Cathedral, which possesses great beauty of design and execution.

Here are to be found the bryony, sycamore, columbine, vine, fig, and other plants, well-designed and modelled, although the technique as a whole, is somewhat inferior to that at Southwell.

Mr. Bond, in his "Gothic Architecture in England," well describes this brief period of imitative art thus:—"The reign of purely naturalistic foliage was short, and being peculiarly characteristic of the period c 1280-1315, it is often a useful criterion of chronology.

"As specimens of craftsmanship these carvings are simply consummate. Every capital, corbel, spandril, boss, is a masterpiece.

"Nevertheless it was a mistake, and stands on a far lower level than the conventional designs it superseded. It was a mistake to attempt to compete with nature, man's best efforts can be no more than a coarse reminiscence of nature, the humblest herb that grows in the cranny of the wall, has a beauty man cannot emulate.

"The more successful he is, the more faithful, true, and exact his reproduction of leaf, berry, or bloom, the more he invites comparison with nature, and must suffer from the comparison. The more painting and sculpture resemble camera work, the less artistic they are. Design, indeed, there was none, what credit there was, belonged to the mason, and to nature, who fashioned the leaf, fruit, and bloom."

About 1320 and onward, there came over England a wild craze for the ogee curve, that sinuous subtle line that suggests grace rather than strength, and elegance than simplicity.

The Eastern Sepulchre at Hawton Church, Notts, shows the ogee curve in many aspects, either as a supporting arch, for which it is very unfitted, or as the outline and contour of the ornament.

Foliage thus became extravagantly modelled as if to show the wonderful power over his tools that the 14th century sculptor possessed.

He forgot the beauty of a simple treatment, and loved the bulbous and contorted surfaces he undertook to carve.

To quote Mr. Bond again, "it was as if the craftsman had grown weary of copying healthy foliage, and picking up some leaf stung by a fly, had set to work to reproduce diseased foliage, for the sake of the bulbous swellings that gave the admired ogee curve." In the 14th century the idea of ornamenting stone walls with carved diaper work came to perfection, and many beautiful examples exist all over the country.

The word diaper has a peculiar interest for us just now, for round its birthplace this terrible war has raged for so long. It wants some stretch of imagination to connect the word with Ypres, that interesting

Belgian town, once so famous for its textile factories, yet it was here that a certain cloth was made in the Middle Ages, that was ornamented with square patterns. These woven stuffs d'Ypres were often used to hang round the churches and houses on festive occasions, and gave rise to the idea of carving the walls themselves, and then painting them; the original effect must have been very rich and handsome.

At Lincoln there is a stone screen, covered both sides with diaper work modelled upon the ogee curve, the flower-like rosettes bear but little resemblance to any particular species, and yet there is nothing mechanical about them, each flower differs slightly from its fellows, showing the stamp of the hand, not of the mould. The centre of one flower forms a nest, and across two others are birds flying to and fro, a delightful little touch of nature.

After the much modelled work of the 14th century, the pendulum swung back to a more conventional rendering of natural forms, not the stately growth of the 13th century, but rigid symmetrical leaves, shrunken in size and angular in outline. To see late Gothic foliage at its best, one naturally turns to wood-carving rather than to sculpture, the more pliable material made it easier to show its dried up, crinkly, appearance.

Ruskin aptly describes the northern Gothic leafage of this time as "Crisp and frost-bitten, wrinkled at the edges, and sparkling as if with dew." It certainly does suggest the winter of mediæval art, yet even in its coldness, there is some beauty left, as the exquisite screens, pulpits, and bench ends of the east and west of England, can prove.

In the churches of Devon and Cornwall, there are to be found occasionally, perfect treasure houses of sculptured capitals, based upon nature, as at Kenton and Ogwell.

A series of these elaborate features has a great artistic value in the designing of a church interior, for the difference between the smoothness of the column below, and the mouldings above, with the fretted surface of the carving, is very valuable, it arrests the eye, accentuates the importance of the capital, and a long row of them make a strong horizontal line, which counteracts any vertical tendency that might give a sense of weakness to the proportions.

Gothic art gradually faded away in the 15th century, but even in the first half of its successor, some rich leafage work was done, a last spurt, as it were, before it gave place to another style.

One of the richest specimens of Tudor stone carving is the Oldham Chantry, Exeter, it is really too lavishly ornamented, for like many other late Gothic buildings, almost all the surfaces, flat or moulded, were worried into some kind of pattern; there is no repose.

There is, as before mentioned, a certain coldness about this work, in spite of its excellent technique, good drawing, and careful planning. It seems uninspired, and lacks soul, the tender individual touch is missing. The carving is neat and accurate, but it does not appeal to the imagination half as much as the rougher and simpler work, into which one feels the artist has put his best thought and skill.

It has been said that "Variety is the salt of ornament," and this is entirely true of Gothic art at its best; of course, there are certain

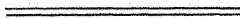
characteristics running through each century, roughly speaking, but each artist worked out his interpretation of nature, setting his seal upon it, and making it his alone.

If the designers of the Middle Ages were too reserved in their use of nature, the artists of the Renaissance went to the opposite extreme, and the traditions of ecclesiastical art no longer holding good, they worked for self-glorification, their enthusiasm for something gay and pretty knew no bounds, and one only has to go through some of our museums to see what happened.

The artists of the 17th and 18th centuries loved nature so much, that they reproduced her in every aspect, whether suitable or not.

They did not stop to make an agreement with her, and accept only what good ornament requires, but they laid hold of everything; flowers and fruit, beasts, birds, caterpillars, and snails were jumbled together in hopeless confusion.

One can have too much of a good thing, and too much nature in ornament is a mistake, especially on any object that has a utilitarian purpose. The Gothic designers never sinned deeply in this respect, and although we may be critical at times, there are few people who do not love and respect the work they have left us.



NOTES ON THE LIFE-HISTORY AND VARIATION OF EUCHLOE CARDAMINES, L.

(Read November 2nd, by HAROLD B. WILLIAMS, LL.B., F.E.S.)

On March 17th, 1914, I read before this Society a short paper on "The minor variation of *Euchloë cardamines*." That paper was woefully incomplete for several reasons, the chief being that the amount of research work necessary was considerably greater than the time available for the preparation of the paper would allow. However, the paper served as an introduction to the subject, and I hope the society will accept my apologies for the somewhat belated completion of the work.

In the present paper will be found brought together most of the useful information hitherto published as to the life-history and variation of the species, supplemented by notes of my own.

To the best of my knowledge there is no synonymy to unravel, at any rate so far as the specific name is concerned. Thus there is no fear of a name obsolete for all practical purposes and unknown to this generation being revived and thrust upon an unwilling entomological public as the true and original name of the species.

ORIGINAL DESCRIPTION.—The original description reads as follows:—"P.D. alis integerimis rotundatis albis; primoribus medio fulvis, posticis subtus viridi nebulosis." (Linn., Syst. Nat., ed. x., p. 468.)

IMAGO.—The expanse of the wings varies from 30mm. to 52mm., these measurements being extreme in each direction. Commonly from 37mm. to 46mm. My smallest ♂ expands 34mm., smallest ♀ 42mm.; my largest ♂ expands 47mm., largest ♀ 50mm. Frohawk gives the average expanse as 46mm., which is, I think, rather large. In my experience 42mm., the figure quoted by Wheeler, is a fair average.

Upperside—Male.—The ground colour white, the apex of forewings black, dusted over more or less densely with orange scales, the outer margin spotted with black, dusted with orange at the ends of the nervures, these spots being frequently confluent towards the apex. Fringes chequered with black and white; the discoidal spot black, the costal area frequently suffused with pale yellow and slightly dusted with black, the outer half of the wing occupied by a rich orange patch, extending inwardly as far as, or just within, the discoidal spot, rarely reaching the anal angle, occasionally terminating well above it. The marbling of the underside shows through, appearing very pale grey on the hindwing, the tips of the hindwing nervures black, the fringes marked with black at the nervures. The two or three black spots at the outer angle usually more strongly marked than the remainder. The base of all wings dusted with black.

Female.—Slightly larger than the ♂, the orange patch on forewings absent; black apical marking larger, and dusted with white, not orange, scales; the discoidal spot larger.

Underside—Male.—The forewing white, costal area ochreous-yellow spotted with black, the apex white, dusted with black and yellow scales, giving the appearance of a pale greenish mottling, outer margin similarly mottled, rather more strongly. The apical patch

more extensive than on the upperside, the orange patch less extensive in consequence, and usually less fiery in colour. The hindwings white, ornamented with an intricate marking, apparently of a yellowish-green colour. There is no green pigment, the appearance being due to a mixture of black and yellow scales.

Female.—Similar, but without the orange patch on the forewings. On the underside the apical patch is not larger than in the male, as on the upperside, and the disparity in size of the discoidal spots is not so marked.

SEXUAL DIMORPHISM.—The nature of the sexual dimorphism exhibited by this species is indicated in the above short descriptions. The orange patch in the male is variable in extent, usually, in British specimens, extending to just within the discoidal spot. Occasionally, particularly in small specimens, it only just reaches the discoidal spot. In some specimens the patch is more extensive, *e.g.*, Earl refers (*Ent. Rec.*, xxii, p. 167), to the capture near Täsch of "the Swiss form of *E. cardamines*, large and strong on the wing, the large orange tips covering quite two-thirds of the upper wing." Frohawk exhibited a form (South-London Ent. Soc., March 27th, 1913), in which "the discoidal spots of the forewings were considerably within the orange apical area," clearly a form with enlarged orange blotch, though the description seems to suggest a change in position of the discoidal spots. It is to be noted that, though in British specimens it is rare for the orange patch to be so extensive as to reach the anal angle, this is common in Continental specimens, and was suggested by the late Mr. Jenner Weir to be a character definitely separating the British specimens as a local race. (See Proc., South-London Ent., etc., Soc., 1888-9, p. 40).

A male with orange patches on the hindwings was in the "Briggs coll.," and was sold with that collection. A detailed description of this specimen would be interesting, but I am unable to trace it.

Females with irregular orange markings occur with some frequency. One suspects these to be gynandromorphic in some degree, and they will be referred to under the heading "Gynandromorphism."

VARIATION.—This species is probably the most variable of our native Pieridae, and it is very difficult, and indeed, almost impossible, to classify the various forms in any satisfactory manner. The variation in size I have already dealt with. It remains to add that small specimens are known as *ab. minora*, Selys., or *ab. turritis*, Och., and large specimens as *ab. major*, Tutt. The ground colour is subject to variation in both sexes. The male occasionally develops a yellow tint, not very pronounced as a rule, though a specimen has been recorded as yellow as *Euchloë euphenoides*. A yellow suffusion on the underside of the forewings is rather common (*ab. citronea*, Wheeler). The female occasionally has the hindwings suffused with yellow (*ab. ochrea*, Tutt), and this is particularly characteristic of Irish specimens. The orange patch on the forewings of the male is subject to considerable variation, both in extent and in intensity of colouring. There is a very fine "lemon-tipped" form (*ab. aureoflavescens*, Ckll.), and all sorts of intermediates occur between this and the type. In looking over a long

series of what one would ordinarily describe as "typical" specimens in this respect, numbers of different tints are observable, the difference being negligible for practical purposes, and certainly not warranting the imposition of a kind of super tax on the entomological memory, by the allocation of aberrational names, but interesting as leading up to the extreme forms, *e.g.*, an example with "curious pale orange" tips is recorded by South (*Ent.* xxxv., p. 2), taken at Plumstead by Sabine. On the underside the orange patch is sometimes less extensive, and specimens occur with inter-neural white dashes. The black apical markings vary in both sexes, forms occurring, more commonly in the ♀, with the apex light grey instead of black, owing to the white scales with which the apex is dusted spreading over the whole. The apical blotch may be extended inwards in the direction of the discal spot, and I have a fine form of the male in which the black outer-marginal spots are united to each other and to the apical blotch, forming a continuous band along the outer margin of the wing, and turning inwards close to the hind margin as far as the edge of the orange patch.

A rare aberration (*ab. lasthenia*, Mill) has the black markings entirely suppressed, an instance of true albinism.

The development of a discoidal spot in the hindwing is a not uncommon form of aberration, and occurs also in *Euchloë euphenoides* and in *Anthocharis tagis* var. *bellezina* (vide *Ent. Rec.*, xxi., p. 151).

The discoidal spots of the forewings vary from minute dots to large and conspicuous spots.

In the *Entom.*, xxxi., p. 300, is a note of an exhibit by Merrifield of specimens of *E. cardamines*, bred as a result of temperature experiments, those cooled having the apices of the wings darker and the discal spots smaller than those which had been forced.

Various bizarre and unclassifiable forms have been recorded from time to time, *e.g.*, Sabine records (*Ent.*, xxxvi., p. 289) a ♀ specimen taken in May, 1902, at Darenth, having two longitudinal streaks on the underside of the hindwings, extending from just inside the cell almost to the outer margin of the wing. We are not told what colour these streaks are. In the Mason coll. there was a ♂ in which the orange patch on the left forewing did not extend to the apex.

In the *Ent. Rec.*, x., p. 257, Thornhill describes a specimen captured in May, 1898, near Boxworth, Cambs., and figures both surfaces. The specimen is a ♀, and has "the right forewing entirely blackened, except along the costa, which is normal, and there are two or three slender, broken, whitish streaks running through the discoidal cell to the outer margin; another short marginal one is placed just above the anal angle." The outer fringes are of the same dull blackish tint. The right hindwing is quite normal and shows no melanic tendency whatever. The left forewing is normal towards the costa and apex, but is blackened towards the inner margin from the anal angle to the base. Similarly the left hindwing is normal in its upper part, but the lower half is almost entirely melanic, and the fringes agree in tint with that part of the wing to which they are adjacent. On the underside the right forewing has a fine short black streak from the anal angle half way along the inner margin, the fringes alternately

light and dark; the left forewing has a longitudinal streak almost filling up the discoidal cell, and continued from it as a fine line to the outer margin. The underside of the hindwing proves most interesting, for, although the melanic patches and lines are limited to the discoidal cell and the margin directly beyond, they are of a dense opaque nature, entirely different from the blackness of the upperside; the yellow scales overlay this thick blackening in some places. The left hindwing beneath has, however, in addition, a dull black streak, extending from the discoidal cell to the outer margin."

Frohawke (*The Field*, January 30th, 1915) refers to a ♂ specimen in which the orange patch on the right forewing is obliterated by white scales (Rothschild coll.), and other curious forms are mentioned by Barrett.

In discussing the forms in detail it will be convenient to treat first of the forms peculiar to each sex, then of the forms common to both sexes, and lastly of the local races.

I.—MALE FORMS.

(a) ab. *aureoflavescens*, Ckll., *Entom.* xxi., p. 189 [1888], *lutea*, Gillmer, *Ent. Zeits. Guben*, xx., p. 237 [1907].

"For the variety of *Euchloë cardamines* in which the orange is replaced by clear yellow, the name *aureoflavescens* may be used."

This must be a rare form. Mosley (*Vars. Brit. Lep.*), figures a specimen taken at Croft in 1877, and Harwood (*Ent. Rec.*, xi.), records breeding a specimen, and others have been taken from time to time. Intermediates are more frequent. I have one in which the patch is of two shades, being divided into alternate dashes of lighter and darker orange. Daws (*Ent. Rec.*, i., p. 98), records a somewhat similar specimen.

(b) ab. *crocea*, Röber, *Seitz. Macrolep.*, i., p. 54.

"In Asia-Minor a pretty aberration has been found, which has a lemon-yellow apical patch to the forewing, the patch being of the same size as in *turritis*."

Having regard to the rarity of these forms, it seems hardly necessary to have separated this form from the preceding, from which it only differs in the smaller extent of the lemon-yellow apical patch. A specimen taken 23rd May, 1909, at Croydon, by Palmer, and described in some detail in the *Ent. Rec.*, xv., p. 189, appears to be referable to this form.

(c) ab. *salmonæa*, Obth., *Lep. Comp.*, iii., p. 140.

"La tache apicale rose-saumon."

(d) ab. *sassafrana*, Obth., *Lep. Comp.*, iii., p. 140.

"La tache apicale d'un jaune safrané très pâle."

Oberthür describes these two forms from specimens in his own collection. The first, he says, is an English specimen, and the second, a very large and fine specimen, was taken on May 24th, 1903, at Chantilly.

(e) ab. *flavido-virescens*, Obth., *Lep. Comp.*, iii., p. 140, figured Obth., *Lep. Comp.*, vi., pl. 126, fig. 1119.

"La tache apicale d'un jaune citron clair et tendant au verdâtre."

Described by Oberthür from a specimen ex. coll. Wiskott from East Prussia. The underside of the forewing has the same yellow suffusion.

The specimen "with green tips" exhibited at the South-London Ent., etc., Soc., on November 28th, 1912, by Mrs. Hemming, may be referable here, though the description is somewhat vague.

(f) ab. *flava*, n. ab.

"The ground colour of both fore- and hindwings of a bright canary or lemon-yellow."

This is a very rare form. It is figured in Mosley from a fine specimen in the Gregson collection, taken near Southport, which is referred to by Gregson in a paper in the *Entom.*, iii., p. 211. A less extreme specimen was exhibited at this Society on March 17th, 1914, by Mr. C. H. Williams. Another is recorded by Newman (*Illus. N.H. Brit. Butts.*, p. 156).

(g) ab. *sulfureorennata*, Keynes, *Ent. Rec.*, xxii., p. 239.

"♂, of normal size. On the upperside hindwing, the upper margin of the central cell, and the upper four veins radiating from the cell to the margin of the wing, are all strongly marked with bright sulphur-yellow."

I have never seen a specimen of this form and know of no other records. It seems to approximate to the eastern form, *thibetana*, Obth.

(h) ab. *detersa*, Verity, *Rhop. Pal.*, p. 191.

"The orange spot of the ♂ almost completely wanting."

This must be a rare form. I have never seen a specimen.

(i) ab. *umbrosa*, Culot, *Bul. Soc. Lep. Gen.*, p. 69, and plate i., fig. 1 (1908).

"Orange apical patch preceded by a black shade. All the other characters agree with var. *phoenissa*, i.e., underside much more white than *cardamines*, and black central dot larger and placed on the edge of the apical patch. Seven or eight males from Delepta (Lebanon)."

This form is described as a sub-variety of var. *phoenissa*, Kalchb. Verity (page 191) says, "a very characteristic form of *phoenissa*, on the other hand, seems almost to approach *grüneri* in the presence of a diffuse black band separating the inner edge of the orange patch from the white ground (form *umbrosa*, Culot.). The "types" are from Lebanon, but I possess specimens from Jerusalem and Beyrout."

(j) ab. *citronæa*, Wheeler, *Butts. Switz.*, etc., p. 64 [1903].

"Underside forewing with yellow ground colour, except inner margin."

This is a rather common form, though extreme specimens are perhaps not often met with. Oberthür speaks of it as very frequent, and a yellow underside to the forewing is characteristic of several local races. I noted the form as more abundant than usual in Surrey in 1915.

II. FEMALE FORMS.

(k) ab. *ochrea*, Tutt, *Brit. Butts.*, p. 245 [1896].

"The hindwings almost entirely yellow. Figured by Hübner (figs. 791-2); usually a ♀ form."

I have never seen or heard of a ♂ specimen, though ♀♀ are rather common.

(l) ab. *nigrocellularis*, Obth., *Lep. Comp.*, iii., p. 140.

"Aux 2 ailes superieures le point discoidal noir est transformé en une tache longue et épaisse, en dessus comme en dessous, et tendant vers la tache apicale noirâtre qu'elle n'est pas bien loin d'atteindre."

Described by Oberthür from a specimen ex coll. Reynauld (Lyons).

(m) ab. *caulotosticta*, n.ab.

"Upperside, forewing with the discoidal spot very large and branched, the upper portion being extended along the subcostal vein towards the base."

I have specimens of this form from Pantou and Hazeleigh. It appears to be uncommon.

(n) ab. *commaculata*, Obth., *Lep. Comp.*, iii., p. 140.

"Ce sont des ♀ dont les ailes superieures sont plus ou moins maculées à l'apex de la teinte rouge aurore qui caractérise les ♂."

These specimens are probably in some degree gynandromorphic, and I have dealt with them under this head.

III. FORMS COMMON TO BOTH SEXES.

(o) ab. *cinerea*, Newnham, *Ent. Rec.*, i., p. 242.

Newnham says:—"On May 17th, 1886, I got a variety of *Anthocharis cardamines* in which what appears to the naked eye to be green markings on the underside of the hindwings, as well as those on the underside of the tip of the forewings, were replaced by cinereous gray markings. This I have called ab. *cinerea*."

I have already drawn attention (*supra*) to the nature of the "green" marking on the underside. Variation in its intensity, due, no doubt, to modification of the yellow scales, is not uncommon. I have not seen a specimen of ab. *cinerea*, but it is possibly an extreme form of this phase of variation, due to the yellow scales being replaced by white ones.

Röber (*Seitz, Macrolep.*, i., p. 54) omits this form, and it is inserted by him in a list of "Additions and Corrections" at p. 71, where, however, the description is incorrectly quoted as referring only to the apical area of the forewings beneath.

(p) ab. (et var. ?) *turritis*, Och., *Schmett. Eur.*, iv., p. 156 [1816], *hesperidis*, Newnham, *Ent. Rec.*, v., pp. 97, 219 [1894], cf. pp. 146, 172.

"Very small, distinguished by having the central spot on the edge of the orange-coloured spot, whereas in *cardamines* it is placed within it."

Ochsenheimer describes this form as an aberration from Italy, and says he has seen both sexes under the name *S. turritis* in the collection of the Abbé Mazzola. The form is of frequent occurrence in Britain and has attracted a considerable amount of attention. Newnham writes (*Ent. Rec.*, v., p. 97), "For some time I have been of opinion that we have two species of this genus in England. The insect which I now take to be an insect new to our fauna, is much smaller than *E. cardamines*, measuring on an average only about an inch and a quarter

from tip to tip of the forewings. The discoidal spot is placed as in *E. turritis* and *E. gruneri*, at the juncture of the orange and white spaces, not, as in *E. cardamines*, well within the orange tip. When viewed under the microscope the wing scales appear very different from those of *E. cardamines*. This insect differs from the true *E. turritis* (which is now, I think, very generally looked upon as a distinct species) by its smaller size, which appears constant, and by the costa of the forewings being dotted with black It is much rarer here than *E. cardamines*, and is restricted, so far as I know, to a small area. I propose to call this new species *Euchloë hesperidis*."

At p. 146 of the same vol., Newnham writes that he and three friends, after carefully examining the species under an excellent microscope, unanimously came to the conclusion that *E. cardamines* and *E. turritis* are distinct species. Kirby is quoted by Newnham, but says that he treated *turritis* as a species, on the strength of Watson's statement that it had a different plumule, but later discovered that Watson had wrongly identified his specimen, and had called *gruneri* or *damone* by the name of *turritis*.

With regard to the alleged difference in the scales, Buckell very pertinently observes (*Ent. Rec.*, v., p. 173), that one would expect this on physiological grounds, even if the small form consists of ill-fed specimens of *cardamines*, for it is very clear that the scales being structural, and built up from the material in the pupa, must suffer in common with the other organs of the imago.

Tutt remarks (*Ibid.*, p. 173), that his specimens vary in size imperceptibly from the smallest to the largest, "except in the case of one ♀, which is quite a monster." He gives a description in tabular form of 22 ♂s, and concludes that the position of the black spot in regard to the orange blotch is due almost directly to the size of the latter, compared with the size of the insect. The most noticeable of the specimens tabulated by Tutt are two very small specimens from West Ireland, 1880, with discal spot 'tiny' and well in the blotch, which is large (for size of specimens), and two large specimens from Chattenden, which have the discal spot on the margin of the orange blotch owing to the restricted size of the latter.

Newnham (*Ent. Rec.*, v., p. 219), says that out of 22 ♂s, taken by himself, which range in size from $1\frac{7}{16}$ " to $1\frac{3}{8}$ ", not a single specimen exhibits the discoidal spot in any position other than well within the orange tip. On the other hand, out of seven ♂s of the insect he calls *E. hesperidis*, which vary in expanse from $1\frac{7}{8}$ " to $1\frac{5}{8}$ ", all have the discoidal spots placed at the juncture of the white and orange. He says "the ♀s of the latter resemble small ♀s of *cardamines*—both sexes appear much more slender than *cardamines*, even allowing for the difference in size." Under a powerful microscope the plumules of *E. hesperidis* are narrower and proportionately much larger than those of *E. cardamines*.

Kirby (*Handbook, etc.*, ii., p. 189), treats this form as a distinct species, on the strength of Newnham's statements. He also, as I think, wrongly, refers the insects mentioned by Barrett (*Lep. Brit. Isl.*, x., p. 29, etc.), to *hesperidis*.

For my part I have no doubt that *turritis* (= *hesperidis*) is a variety of *cardamines*, differing from *ab. minora*, Selys., merely in the diminution in size of the orange patch, so that it only extends inwards as far as the discoidal. The comments of Tutt and Buckell appear to me conclusive. It is a form of frequent occurrence, though rarer than *ab. minora*. It is possibly racial in parts of Italy and Sicily, and in Asia-Minor (Barrett, Oberthür, etc.).

(q) *ab. minora*, Selys., *Ann. Soc. Ent. Belg.*, i., p. 6 (1857).

minor, Ckll., *Entom.*, xxii., p. 176 (1889).

"Of very small size."

This is the common small form of the species in which the markings have undergone no modification. Cockerell named the form by reference to Barrett's article (*E.M.M.*, xxv., p. 81 [1888]). Barrett says, "When living at Haslemere, in Surrey, I used every year to meet with perfect dwarf specimens—about one half the normal size—in both sexes, and the males of this variety were invariably the earliest specimens seen."

Barrett also refers to and figures the form in *Lep. Brit. Isl.*, i., p. 29, and Kirby (*Handbook*, etc., ii., p. 189), quotes this passage under *hesperidis*, which name, he says, has lately been proposed for it. Tutt (*Brit. Butts.*, p. 245), treats both *minor* (= *minora*) and *hesperidis* as synonyms of *turritis*, and it must be conceded that the difference between *minora* and *turritis* is very slight. Röber (*Seitz, Macrolep.*, i., p. 54), treats *minor* as a synonym of *turritis*, which, however, he separates from *hesperidis*, dismissing the latter as "a dwarfed form." Röber gives no reasons for this and it is impossible to guess at any. As if this were not confusing enough, Cockerell, in the *Entom.*, xlv., p. 323, in a criticism of Seitz's work says, "*A cardamines* var. *minor* is not *turritis*, but is the dwarfed form (*hesperidis*). The name *minor* has priority." The only comment on this is that if *minor* is *hesperidis*, it is also *turritis*, but I prefer to ignore the last note and deal with the forms according to their respective original descriptions.

The name *minora* has priority over *minor*, and is described as a variety, rare in Belgium, but as the type is abundant in Belgium (Turner, *in litt.*), there appears to be no reason for treating it as anything but an aberration. Lambillion (*Cat. Lep. Belg.*) says the form is half the size of the type, and this agrees with the description referred to by Cockerell.

A number of records of small specimens are to be found in the magazines, but owing to the method of measurement employed—"from tip to tip"—the majority are valueless for purposes of comparison. The form is a very common one.

(r) *ab. major*, Tutt, *Ent. Rec.*, ix., p. 224 (?).

I am unable to trace the description of this form and it is not referred to in Tutt's *British Butterflies* (1876). Tutt, writing of the *Rhopalocera* of the Basses Alpes in April says (*loc. cit.*), *E. cardamines* "well out and abundant, variable in size, extending from *ab. major*, Tutt, to *ab. turritis*, Och." Specimens over 46mm. in expanse are unusually large.

(s) *ab. radiata*, n.ab.

"Upperside, forewing with a series of black dashes from the black apical spot towards, and in extreme specimens reaching, the discoidal."

The black dashes characteristic of this form usually follow the veins. I have a fine ♀ from Co. Sligo, 1915, and ♂♂ are recorded by Barrett from Pembroke (*Ent. Mo. Mag.*, xx., p. 81).

(t) ab. *dispila*, Raynor, *Ent. Rec.*, xviii., p. 298.

"Normal on the upperside, but on the underside of each forewing there is beneath the usual grey-black discal spot an oblong blotch of similar colour and of about the same size."

Raynor describes this form from a ♀ bred at Hazeleigh, Essex, May 21st, 1900. I have a fine ♂, bred April, 1914, from Bexley and several females. A specimen taken at Haywards Heath was exhibited by Adkin at the South London Ent., etc., Soc., on November 26th, 1891.

(u) ab. *quadripunctata*, Fuchs., *Jahrb. Nass.*, v., no. 51, p. 203.

"All the wings with a black median spot above and below, this spot on the forewing above large and streak-like, anteriorly rounded off, truncate behind, the spot of the hindwing above thin and roundish, grey black, beneath very large and deep black, situated within the green markings."

I find this to be a rather common form, especially among Irish examples. I have specimens of each sex bred in 1915, from Co. Sligo, in which the hindwing spot is particularly well developed. Oberthür says he has never seen a specimen, but knows a similar form in *Euchloë euphenoides*.

(v) ab. *immaculata*, Pabst., ix., *Ber. Naturw. Ges. Chemnitz* (1884), p. 16.

"♂ ohne schwarzen punkt in orangen der vordeffügel."

This is a form with the discoidal spot of the forewing obliterated, and must be a very rare form. One or two have been recorded in this country.

(w) ab. *lasthenia*, Millière, *Ann. Soc. Linn. Lyon.*, 1860, 3^{me} livre [pl. 10, figs. 1 and 2].

"Larger than the type. The front wings and the hindwings appear to be more elongate and less rounded than those of the type. . . . The apical orange blotch, which is a little less vivid than in ordinary *cardamines*, occupies the same position, but the border of the apex is entirely without black; also the discoidal spot. . . . The basal area of all four wings is quite white, and the underside markings, which in male *cardamines* always shows through more or less above, are indistinguishable. . . . The green underside spots of the type are replaced by spots of a very faint greenish-yellow, arranged almost in the same way as in ordinary *cardamines*. Antennæ white. The plumules of the frontal tuft (toupet) pure white. Abdomen rather slender and long, white, as well as the legs."

This appears to be an instance of true albinism, and occurs in both sexes. The form is exceedingly rare. A ♂ specimen is recorded (*Ent.*, xlv., p. 28), by Mr. R. C. Hocking, taken near Danbury, Essex, on June 5th, 1911, and excellent figures of both surfaces are given. The forewings are pure white except for the orange blotch, the apex

and outer margin white, and the discoidal spot also white. Oberthür records a ♀ specimen in his collection, and Frohawk records a ♂ in his. A ♂ was in the "Sam Stevens" collection, and was sold with that collection on March 27th, 1890. One imagines that the ♀ would easily be overlooked in nature.

(x) *ab. alberti*, Hoffmann.

Das naturalien cabinet for September, 1894, contains an article on "A supposed new species of *Anthocharis* (*Euchloë*)," by Ernst Albert.

The author has been led by breeding experiments to the conclusion that "*A. cardamines* has a variety which differs from the type in the larva and pupa stages as well as in the colour of the imago; this variety occurs in connection with a different food-plant. The larva is found on *Turritis glabra*, and differs from the larva feeding on *cardamine* in that its colour is blue instead of blue-green, and the lateral stripe is of an intense white instead of a bluish-white colour. The male butterfly has all the markings of the upperside more intense, the orange more fiery, and the black deeper. The chief difference, however, is found on the underside of the forewings, which are shaded with sulphur-yellow as far as the orange blotch. The underside of the hindwings shows less white than in the type, owing to the greater extent of the green marbling, which is dotted with black. In the ♀ the markings are also more intense and the upperside of the hindwing is slightly yellow.

Hoffmann considers that the difference between this form and *A. cardamines*, at all stages of its life history, is sufficient to establish its specific distinctness, and proposes for it the name *Anthocharis alberti*.

It is as large as *cardamines* and not identical with *turritis* (*Ent. Rec.*, vi., p. 31).

IV. LOCAL RACES.

(y) *var. hibernica*, n.var.

"Slightly smaller on the average than the type, the black spots at the ends of the nervures more strongly marked. The ♂ frequently suffused with yellow on the underside of the forewing, the ♀ usually with the hindwing strongly suffused with yellow."

This form appears to occur throughout Ireland. It is figured in South (*Butts. Brit. Isles*, pl. 17).

(z) *var. britannica*, Verity, *Rhop. Pal.*, p. 190 (pl. 38, fig. 8).

"Distinguished by the rather long and narrow forewings, by the restricted orange patch, especially towards the anal angle, and by the extended black apical mark, which reaches to the anal angle, and of which the edge is very diffuse."

Verity says this form occurs "in the British Isles," and although individuals similar to these are met with on the continent, this local race merits the name of *britannica*.

The restriction of the orange patch towards the anal angle in British, as compared with continental specimens, has, as already noted, been commented on by several observers. The extension of the black apical markings to the anal angle, however, is surely not so common in British specimens as to justify its use as a character differentiating British from continental specimens. I have only two specimens agreeing exactly with the description.

In the *Ent. Rec.*, xxviii., p. 97, Verity discusses this form, and lays emphasis on the long and narrow shape of the forewings and the "enormous" extension, both in width and length, of the black apical crescent. He also compares the European forms of *cardamines* to those of *Anthocharis belia* in a very interesting manner.

British Isles (Verity). Brittany (Oberthür).

(aa) var. *montivaga*, Turati and Verity, *Bull. Soc. Ent. Ital.*, xliii. (1911), p. 232.

"A careful inspection of large series, such as that collected by Verity at the Termedi Valdion (1,400 m.), in the Maritime Alps, in 1911, shows that this alpine race has some very constant characters of its own; it is not so much the importance of these characters as the fact that they correspond exactly to the alpine race of *E. belia*, which makes this race remarkable. In fact the best way of describing it is simply to say that the green marbling of the underside of the hindwings stands to typical *cardamines* as those of *simponia* stand to *belia*; they are wide-spread, diffused, and have a fan-like appearance, and they extend from the base along the neuration, whereas in other *cardamines* they give the impression of chiefly consisting in three transverse bands; this is very marked, especially in *meridionalis*, Verity, corresponding to *romana* of *belia*, thus our new race completes the parallel between the two species. ["types" in the Verity coll. (Florence).]"

The parallel variation of the two species is shortly discussed by Verity in the *Ent. Rec.*, xxviii., p. 97.

(bb) var. *meridionalis*, Verity, *Rhop. Pal.*, p. 190 (pl. 38, fig. 10).

"A transition to the eastern races, and very distinct from the northern form on the under surface, of which the green markings are much reduced and of a brighter green, slightly powdered with black instead of brownish, and intermixed with yellow."

Italy, and probably throughout southern Europe (Verity).

I have not had the advantage of seeing specimens of this race, but forms agreeing with the description occur sporadically in Britain. I have one bred from Kentish ova, April, 1914. I am inclined to think this form should be treated as an aberration, but have not sufficient data to form a definite opinion.

(cc) var. *volgensis*, Sheldon, *Entom.*, xlvii., p. 270.

Larger than any I have seen from elsewhere, expanding up to 52 mm. The average expanse of British and European specimens I make to be about 42 mm., and Mr. Wheeler, in his "Butterflies of Switzerland," gives the same expanse. It will thus be seen how large this steppe form is. The discoidal spot of the superiors is smaller than in the type, and the undersides of the inferiors very much less green." (Sheldon).

Abundant in the Tschapurnik Wald at the end of May (Sheldon).

(dd) var. *phoenissa*, Kalchb., *Jahrb. Wien. Ent. Ver.*, 5; p. 27 (1894).

"Distinguished on the underside from the type *cardamines* and its ab. *turritis* itself by the clear white of the apex and outer margins of the forewings, which only on the median veins 2 and 3, sometimes also on the lower radial vein, are covered with green scales, which, however, are quite wanting in a few examples, and by the very reduced yellow-

green trellising on the hindwings, which appear, therefore, predominantly white Beside this, the orange patch of the forewings in the case of var. *phoenissa*, which is the size of an average *cardamines*, is a somewhat richer tone than the last species and its ab. *turritis*, more like *eupheno*, L. The ground colour of all the wings is the clearest white, as in *cardamines*, without trace of shading into yellowish, as is the case in *A. grüneri*, H.-S."

Kalchberg describes this form from a series of 19 specimens from Haifa, in Syria. He also says, "the fact immediately struck me that, in 10 specimens, along the border between the orange patch, which as in the ab. *turritis* only reaches to the black discoidal spot of the forewing, here very strongly marked, and the clear white colour of the basal angle, are more or less numerous black scales, which in two examples even form a strong band of shade such as *eupheno*, L., and *euphenoides*, Stgr., present." (tr. R. W. Robbins).

Verity says (page 191), "This variety, of which the distinctive name is only justified by its absolute constancy in certain regions, is altogether similar to the examples of *turritis*, of which the underside of the hindwing has the green markings the most reduced."

The specimens referred to by Kalchberg as having a black shade between the orange and white areas of the forewing have been separated by Culot as ab. *umbrosa*. (Referred to *supra*.)

Syria and Palestine.

(ee) var. *sajana*, Röber, Seitz, *Macrolep.*, i., p. 54.

"Orange patch enlarged, the basal area of the forewings above yellowish, being deeper yellow beneath, the markings of the underside of the hindwing more regular in shape and lighter."

Eastern Japan.

(f) var. *extensa*, Röber, Seitz, *Macrolep.*, i., p. 54.

"Almost the whole forewing orange-red, hardly one-fourth of the wing being light yellow, the orange deeper than in the other forms, but not so dark as in *bambusarum*."

China (Nanking).

Röber says this leads over to the next form (*speciosa*), being a connecting link.

(gg) var. *speciosa*, Röber, Seitz, *Macrolep.*, i., p. 54.

"Very large, the orange patch fiery, distinct black spots on the discocellulars and at the discal margin of the hindwing, the green markings of the hindwing beneath almost regularly band-like."

Southern Styria.

Röber says he is at present unable to decide whether this is a local or individual form. It is figured in Seitz, i., pl. 229.

(hh) var. *orientalis*, Röber, Seitz, *Macrolep.*, i., p. 54.

"Very large, the orange patch of a deep tint and almost as large as in *sajana*, upperside of hindwing darkened in consequence of the strong development of the greenish markings of the underside, slightly yellowish; forewing beneath deep sulphur-yellow in the proximal portion of the cell, the yellowish-green markings of the hindwing strongly widened, the white ground colour being much reduced."

Buchara.

(ii) var. *thibetana*, Obth., *Et.*, xi. (1886), p. 16; cf., *Lep. Comp.*, iii., p. 138 (1909).

"Diffère du type européen parce que les ailes inférieures sont lavées du jaune soufre sur les nervures, la tache aurore d'une teinte plus orangée et moins rouge que chez les exemplaires européens. La ♀ a la tache apicale grise et très faiblement accentuée."

Leech (*Butts.*, *China*, ii., p. 477), says, "In this form of *A. cardamines*, which is very common in Western China at Ta-chien-lu, Pu-tsu-fong, and Wa-ssa-kow, the male has the secondaries more or less suffused with sulphurous, especially about the nerves. I have examples similar in this respect from Greece and Asia Minor; the dark apex of primaries is much suffused with orange scales. In the female the apical black marking does not extend to the margin (this is also the case in some of my Syrian specimens of the same sex). The most important characters of *thibetana* are the broader wings and much larger chequered fringes, which give the wings the appearance of being scalloped towards the apex."

cf. ab. *sulfureovenata*, Keynes.

In addition to the above-named forms, there are two names, which have been used in relation to the species, which should be referred to.

Aurore, Engramelle, is a fancy name for the species.

Cardaminoides, Wailly, is suggested (*Entom.*, xiii., p. 139), as a name which might in certain circumstances be proposed for the remarkably large and brilliantly coloured second brood specimens which occur near Bordeaux.

TERATOLOGICAL SPECIMEN.—♂, left forewing with a round hole beyond the cell between veins 3 and 4; left hindwing with a larger hole at lower end of cell, the discocellular vein being displaced outward round it; right hindwing somewhat distorted and reduced.—Hazeleigh, bred 1900, by the Rev. G. H. Raynor (*Brit. Mus. Coll.*, Hampson, *F.M.M.*, xxxvii., p. 117).

HYBRIDITY.—A possible hybrid between *E. cardamines* and *E. euphenoides* is described by Dr. Chapman in the *Entom.*, xxiii., p. 145. His description may be quoted:—

"My specimen is like a *cardamines*, with a wash of yellow on the upper surface, not so deep as that of *euphenoides*, and accompanied by a dark shade across the wing, as in that species, continuous with a dark shading along the costa. The black at the wing-bases is also more extensive than in *cardamines*. Beneath it resembles *cardamines* most, but the green markings of the hindwing are somewhat more restricted, with wider and more open clear spaces, though just along the costa more numerous and darker, as often occurs in *euphenoides*."

Dr. Chapman states that the specimen was taken on March 3rd, 1889, at Auribeau, near Cannes, and suggests that, if not a hybrid, it is a form of *E. grüneri*. South agrees as to the possible hybrid origin, and mentions examples of *E. cardamines* from Syria (Leech coll.) with traces of a black internal edging to the orange patch (ab. *umbrosa*, Culot).

GYNANDROMORPHS.—In Turner's article (*Ent. Rec.*, xxvii., p. 58) reference is made to eighteen halved gynandromorphs, of which seven

had the right side ♂ and eleven the left side ♂. This return includes those recorded to 1901, and reference is given to the complete records. The species is remarkably prone to gynandromorphism, and I append descriptions of those which have come under my notice, and regret that I have no time at my disposal at present to complete the record.

I. Regularly halved.

(a) Right side ♂, left ♀. Taken by the Rev. F. B. Newnham (at Church Stretton, Salop?), May 25th, 1888.

(b) Right side ♂, left ♀. Crowley coll. (dispersed 1902).

(c) Right side ♂, left ♀ } Briggs coll., *vide* Barrett, *Lep. Brit.*

(d) Right side ♂, left ♀ } *Isl.*, i.

(e) Right side ♂, left ♀, bred from a larva found at Hever, Kent, by Mr. G. Meade-Waldo, 1908 (exh. Ent. Soc. Lond., March 17th, 1909).

(f) Right side ♂, left ♀. Taken June 6th, 1879 (at Epping?), Wm. Dean.

II. Not regularly halved.

(a) ♀, "dashed with orange," Cambridge, early seventies (Raynor, *Ent. Rec.*, xviii., p. 297).

(b) Left side ♂, right ♀, dashed with male colouring. Briggs coll. (*Ent. Rec.*, viii., p. 272).

(c) ♀, the left side streaked with orange on upper and under sides. *Ibid.*

[(d) ♂, with a white streak through the orange patch (exh. South London Ent., etc., Soc., November 28rd, 1911). ? Gynandromorph.]

(e) Left side ♀, right ♂, the orange has a splash of white through it on both upper and underside of wing. There is also a black streak radiating from the tip of the wing towards the centre. Taken at Oxshott, May 12th, 1911, by Mr. B. S. Williams.

(f) Left side ♂, right ♀ with the exception of a splash of orange pigment on the underside of the primary. Taken near Winchester in 1899 (Shepherd-Walwyn).

(g) ♀, one forewing has a large patch of orange colour on the underside only (exh. Ent. Soc. Lond., June 5th, 1878, Fingi).

(h) Left ♂, right ♀. Du cote ♀ au dessous, en voit quelques taches rougeâtres entre le point discoidal noirâtre et l'apex. (Chartres, Oberthür.)

(i) "Two ♀ ♀ streaked with orange." Mason coll.

(j) "Two ♀ ♀, each of which had a dash of the orange colour of the ♂ on one of its forewings" (exh. Ent. Soc. Lond., February 2nd, 1870, Prof. Westwood).

(k) Upperside left forewing entirely ♂, the right forewing entirely ♀. The hindwings normal in colour. On the underside the left forewing is ♂, a pure white stripe occupying nearly the whole of the costal margin, and a second white stripe passing nearly through the middle of the wing, being interrupted by the central black spot. The right forewing is entirely ♀. The hindwings are normal in markings (Gregson coll., *Entom.*, vii., p. 70).

(l) Left side ♀ except for a broad stripe of orange from the cell, just below the discoidal, to the outer margin, and a small spot of orange just below it (underside). Figured in Barrett from Dr. Mason's coll. No further particulars given, *cf. (i) supra*.

(m) Upperside ♀ except for a slight dash of orange on the costal nervure near the tip of the right forewing. The discoidal spots of equal size. Undersides right forewing normal ♂, left forewing normal ♀ except for slight orange markings on some of the nervures in the region of the tip, and one orange spot below the discoidal spot, which is larger than that on the other wing. Secondaries normal ♀. (Taken by Mr. Bellamy. Machin coll.)

(n) Right ♂, left ♀ except for two small orange spots near the tornus. (Briggs coll., figured Mosley, *Vars. Brit. Lep.*)

(o) ♀, left forewing with a large orange spot at the tornus. Right forewing with a broad stripe of orange from the discoidal to the outer margin. (Dr. Gill coll., figured in Mosley.)

(p) ♀, right forewing with an orange stripe on costa from discoidal to apex, another shorter one just below it extending into the black apical spot. (Mason coll., figured in Mosley.), *cf. (i) supra*.

(q) ♀, underside left forewing with a small orange dash between discoidal and tornus (Colchester, June 1900, coll. mihi).

(r) "A partly gynandromorphous specimen" (no details). (exh. South London Ent., etc., Soc., November 25th, 1909, Hemming).

[(s) ♀, a thin streak of yellow scaling on the left forewing and another much darker at the base of wing, with aberrant marbling on the underside. (? gynandromorphic) exh. South London Ent., etc., Soc., August 25th, 1910, Newman.]

EGG-LAYING.—The eggs are laid singly on the flower-heads and leaves of the various *Cruciferae* on which the larvæ feed. Probably no lepidopterous egg is easier to find than this, the picking of a bunch of flowers of *Cardamine pratensis* or *Sisymbrium alliaria*, as the late Mr. Tutt observes (*Brit. Butts.*, p. 246), usually giving a good supply. On May 24th, 1914, at Headley Lane, I found 25 ova on a single well-grown plant of *S. alliaria*. Some were laid on the leaves, and in this case always on the lower surface, but the majority on the pedicels of the flowers. I have also found them on the base of the calyx of a flower, both open and in the bud stage, and when laid in this position on *Brassica arvensis*, they are somewhat difficult to detect. On *Sisymbrium alliaria* I have also found ova on the stalk supporting a well-developed seed-pod, and actually on the pod. There can be no doubt that in most cases in which ova are deposited on the flower-heads, the seed-pods will be more or less developed by the time the young larvæ are excluded. Bird records (*Ent. Rec.*, xxv., p. 55), observing, on June 2nd, 1910, a female busily ovipositing on *Lunaria biennis* (Honesty). "She fluttered around a large clump of this plant in the garden for several minutes, flitting from plant to plant to lay her eggs, and frequently visiting the flowers for nourishment. Quite a large number of eggs were laid, all deposited singly on the stalks of the withering flowers and young seed-vessels, and also on the flat sides of

the nearly fully-developed green discs." Bird also records (*Ent. Rec.*, xxv., p. 86), the ova deposited singly at the side of the clump of flower-buds at the upper end of the stem of *Capsella bursa-pastoris*.

Floersheim also mentions the habit of the female of feeding frequently while ovipositing. He says (*Ent. Rec.*, xviii., p. 209), "The ova, which I saw laid, were deposited singly on the stalks of the flower-heads and unopened buds of *Erysimum*, the butterfly pausing in her labours to feed. After laying a few eggs, indeed, I watched one on several occasions suck the honey from the very flower-head beneath which it had laid the ovum. . . . From 11 a.m. to 2 p.m. seems to be the usual time for the species to lay their ova."

Chapman (*E.M.M.*, xxiv., p. 257), makes a similar observation, and says, "At the time this occurs there is usually about an inch of the stem occupied by seed-pods already formed, and the pedicel selected for the egg is usually that of a flower nearly over, so that it might equally be called a young pod. The guide used by the butterfly is obviously such a portion of the stem or pedicel as she can conveniently reach, whilst her proboscis also reaches the open flower."

As a general rule only one ovum is laid on the same flower-head, or indeed upon the same plant. At the same time it is no uncommon occurrence to discover two eggs on the same flower-head, and many on the same plant, indicating in all probability the visit of more than one female. In captivity, of course, anything may happen. In such circumstances I have known 8 ova to be laid on a flower of *Hesperis matronalis*, 3 on the calyx, and 5 on the pedicel, and I have also seen one egg laid upon, and at right angles to, another. In this case the first laid failed to hatch.

It is a wise instinct, if the expression may be pardoned, that prompts the female to lay only one egg on a plant, as in the case of such food-plants as *Cardamine pratensis*, one larva will devour the whole plant.

OVUM.—The egg is of the "shuttle" form usual in the *Pieridae*. It is widest just about or rather above the middle, and narrower at the top than at the base. It is more than twice as long as broad. About a dozen ova, of which I took measurements, were $1\frac{1}{4}$ mm. in length. The egg is beautifully ornamented with longitudinal ribs. From the limited observations I have made the number of these ribs appears to be variable. I attributed this to erratic observation, until I observed that Tutt says there are thirteen, whereas Frohawk says "about eighteen." These two figures probably represent the limits of variation in this respect. The colour is pale yellowish-green, almost white, when first laid, reminding one in a way of the egg of *Pieris napi*. This soon changes, first to yellow, and gradually to a deep orange. Before hatching the egg becomes of a purplish-brown. Frohawk calls attention to the fact that in some specimens the crown is transparent, caused by the embryo not reaching quite to the apex. I had not previously noticed this, but on overhauling about 50 eggs this summer*, found one in which the phenomenon was very marked.

Tutt remarks (*Ent. Rec.*, v., p. 138), that the slight basal flattening

* 1915. H.B.W.

would probably not occur if the eggs were laid quite free from any attachment at the base.

EXCLUSION OF LARVA.—The egg hatches in from 7 to 14 days, according to weather conditions. Normally the egg stage is probably of about 10 days duration. The young larva eats through the side of the shell and immediately devours the empty shell. Should an unhatched egg be in the vicinity that also is devoured. In the case of the 8 eggs referred to *supra*, as deposited upon a single flower of *Hesperis matronalis*, only 3 larvæ ever hatched, the remainder being destroyed by their elder relatives in the manner I have just described.

LARVA.—The newly-excluded larva measures 1.5 mm. in length. The head is large and black. The body is of a dirty orange-yellow colour, with minute black spots. The larva is covered with hairs, some of which, under a strong lens, are seen to be bifurcate at their extremities, and to support a globule of colourless liquid. The larva immediately crawls up on to the young seed-pod and commences to devour it. Growth is rapid. A larva that hatched in the early morning of June 17th, 1915, and measured 1.5 mm. in length, was again measured at 9.30 p.m., and had grown to a length of 2 mm. The first instar lasts from just over 24 hours to about 3 days. It is impossible to be dogmatic about the duration of the various stages, as much depends on the weather, but each successive stage is in all probability, normally slightly longer, the last much longer than the preceding, owing to its including the resting period prior to pupation. Before the first moult the larva measures from 3 to 3.5 mm. in length, and before the second from 5 to 6 mm. After the second moult the colour is a dark greyish-green, with black spots, some large and some small, thickly dotted over the surface. The colour is paler towards the sides, but no distinct lateral stripe is evident. The head is green, spotted with black.

I have not measured the larva at the 3rd moult. Frohawk says it measures 10.5 mm. One I measured shortly after the moult was 11.5 mm. long. The colour is a brighter green than in the previous stage, and a white lateral stripe is developed, more sharply divided from the ground colour at its lower edge than at its upper, which fades gradually into the green.

Shortly after the 4th moult the larva last referred to measured 16 mm. long, and 3 days later 21 mm. It ceased feeding when 25 mm. long and pupated after a rest of 4 days, producing a remarkably small pupa. My measurements, therefore, after the 3rd moult must be taken as representing only the smaller larvæ. Frohawk gives 31 mm. as the length of the full-grown larva, which is probably a fair average.

After the 4th moult the colour is an opaque glaucous-green, including the head. The black spots appear more even in size. The lateral stripe is white and distinct. Before pupation the spots appear less conspicuous.

Chapman (*E.M.M.*, xxiv., p. 257), gives a table showing the variability of the time taken by the larvæ to feed up, and concludes that the larva usually hatches on the 8th day, and takes from 16 to 24 days to feed up. His dates are as follows:—

			1st larva.			2nd larva.
Hatched	...	...	June 26th	...	...	June 30th
1st moult	...	...	" 30th	...	...	July 3rd
2nd moult	...	...	July 2nd	...	...	" 5th
3rd moult	...	...	" 5th	...	...	" 8th
4th moult	...	...	" 7th	...	...	" 11th
Change to pupa	...	...	" 12th	...	...	" 19th

HABITS OF LARVA.—I have already referred to the habits of the newly excluded larva of devouring its own egg-shell and any other ova in its vicinity. It must be added that the young larvæ are terrible cannibals, and if a number are confined in a small box it is highly probable that only one or two will reach the second moult. Normally the larvæ feed throughout their existence on the unripe seed-pods, and it has been remarked by several observers that the feeding of the larvæ causes an irregular growth of the seed-pods, thus providing a clue to their presence. The larvæ will eat the flowers and leaves, and even the stems, of their food-plants when the seed-pods are exhausted.

Newman notes (*Entom.*, ii. p. 73) that at first the pods, growing with great rapidity, keep pace with the requirements of the larva. He also states that having watched the larvæ with great attention he has fancied they devoured the seeds themselves with peculiar relish. Sometimes a pod will be pierced exactly over each seed and the seeds consumed, the pod being neglected until the supply of the more favourite viand has failed.

The larvæ feed both by day and by night and grow very rapidly. In the intervals of feeding they rest on the stems and seed-pods, stretched at full length, and closely pressed to the plant. At such times they are extremely difficult to detect. Before each moult the larva spins a thin pad of silk upon the pod upon which it has been feeding, or upon a stem or leaf of the food-plant, and rests thereon during the quiescent period preceding the moult. Before pupation the larva spins a similar pad, and also attaches itself by a silken girth. During the quiescent period before pupation the larva becomes shorter and "stumpier," and the gradual development of the pupa within can be followed.

VARIATION OF LARVA.—The larva is not a very variable one, although, as I have already shown, it presents different appearances at different periods of its life. There is a certain amount of variation in the depth of the green colour in the younger larvæ, and some are of a bluer-green than others. In the full-grown larvæ one notices in addition some variation in the intensity and breadth of the white lateral stripe.

FOODPLANTS.—*Euchloë cardamines* will probably feed upon any cruciferous plant, but the vast majority in nature undoubtedly feed upon *Sisymbrium alliaria* and *Cardamine pratensis*. The following foodplants have been recorded. Those marked by an asterisk I have confirmed by my own observations.

* *Cardamine pratensis* (N.L.N.H.S., Tutt, Frohawk, Newman, etc.).

C. impatiens (Stainton).

* *Sisymbrium alliaria* (Tutt, Sich, Frohawk, etc.).

* *S. officinale* (Frohawke, Tutt, South).

Barbarea vulgaris (Newman, Whittle, Frohawk).

Lamaria bicolor (Bird, Frohawk).

* *Hesperis matronalis* (Tutt, Bird, Newman, South).

* *Capsella bursa-pastoris* (Sich, Bird).

Arabis glabra (Tutt, Newman).

A. alpina (South, in captivity probably).

† *Erysimum* [*cheiranthoides*?] (Tutt, Flandersheim).

* *Brassica arvensis* (Tutt).

B. rapa ["Turnip"] (Chapman).

B. napus (Duncan).

* *B. nigra* (L.N.H.S. Lep. Com.).

Radicula Nasturtium-aquaticum (South).

Cochlearia armoracia (South).

Chieranthus cheiri (South, in captivity).

Galium verum (Davis, *Ent.*, ii., p. 306), wants confirmation.

PARASITES.—*Exorista vulgaris* (Raynor).

PUPATION.—The pupa is attached to a stem, either of its foodplant or of some adjacent plant. Frohawk in *The Field* (January 30th, 1915), suggests that it is but seldom that this species pupates on its foodplant. I have no doubt that his observation on this point is, as usual, accurate. I have never found a pupa in such a situation. In captivity the majority of the larvæ wander about for some time before pupation, and eventually pupate on a stem, or on the muslin sleeve away from the foodplant. In captivity, of course, pupation frequently takes place on a stem of the foodplant, or on a pod, and in such a position the drab form of the pupa is very well protected. The only instance recorded of a pupa found on its foodplant in its natural surroundings, appears to be the one referred to by Mr. Frohawk in his article in *The Field*, which was of the green form, and would, no doubt, be somewhat conspicuous.

Pupation usually takes place head upwards, occasionally in a lateral position. I have seen one case of pupation head downwards. The actual pupation is described by Burrows (*Ent. Rec.*, xvii., p. 243), as follows:—"I recently watched the pupation of *Euchloe cardamines*. I observed that when the larval skin was slipped, the pupa evolved possessed a plain rounded head, without angles, more like a pupa of *A. crataegi*, but that from this rounded head, a something was thrust forward, which took the well-known horn-like shape, into which the pupa finally hardened. Later on, when the time came for the development of the wings, I discovered that the horn was absolutely empty, and that the only part which could have occupied it was the comparatively tiny patch of hair on the head." Burrows asked for suggestions as to the purpose of the horn. Mr. J. A. Osborne shows (*E.M.M.*, xv., p. 60), that if the cincture which the larva spins before pupation is cut, it will pupate suspended in the manner of the *Vanessids*, the means of support being the membrane extending from the lining of the old larva-skin to the anterior horns of the two lateral ridges bounding

† Some of the records under "*Erysimum*" probably refer to *S. alliaria*, H.B.W.

the anal area of the chrysalis. In the case of the *Vanessids* this membrane is ruptured when the pupa has attached itself to the pad of silk spun by the larva.

PUPA.—The pupa measures from 15mm. to 24mm. in length, generally about 22mm. or 23mm., and about 4mm. in width at the widest part, and resembles a dried and withered pod of one of its various food-plants. It is pointed at both ends and swollen in the centre owing to the projection of the wing-cases. It is normally very much "bent backwards." Its colour when first formed is green, the nervures on the wing-cases and some other markings whitish, and changes in about two days to its permanent tint. There is a dark dorsal line and a lateral one of the same shade, with a suggestion of a lighter stripe below.

VARIATION OF PUPA.—This is a subject upon which reams might be written. Roughly the pupæ fall into two groups, the green and the drab, or putty-coloured, forms. Each of these forms, however, is exceedingly variable, and it is scarcely an exaggeration to say that no two pupæ are exactly alike. In the green form particularly the specimens vary exceedingly, varying from a uniform rich dark green to light green, and to a curious muddy-green colour. The drab pupæ vary from a dirty pale ochreous colour to almost black. In the darker forms the light veining on the wing cases is rather conspicuous. The dark dorsal stripe varies in tint and may be of the same colour as the ground colour, but is often greenish even in the drab pupæ. There can be no doubt that in all forms the coloration of the pupa is protective, though our knowledge of the pupal habits of the species in nature is somewhat scanty. The experiments of Merrifield on pupæ of *Pieris napi* (vide *Ent. Rec.*, x., p. 284) clearly show that some faculty for protective coloration is possessed by lepidopterous pupæ. In the case of *cardamines* this has been illustrated over and over again, e.g., at the South London Ent., etc., Soc., on March 12th, 1904, Carpenter exhibited green pupæ on green, drab on drab colour, and zinc-coloured pupæ which had pupated on the zinc top of the cage, and Bacot has on various occasions made exhibits at the City of London Society of pupæ attached to twigs and cards of various shades, and showing distinct gradation in depth of colour corresponding to the lightness or darkness of the substance on which the larva pupated.

The pupa also varies somewhat in shape, particularly in the angle at which the horn-like process stands away from the body of the pupa. This may be in a direct line, or very much bent backwards, according, probably, to the position of the pupating larva. In the case of pupation head-downwards to which I have already referred, the horn appears very much lengthened and inclined forwards at the base to some extent, the whole pupa being abnormally "straight" in appearance.

TIME OF APPEARANCE.—The species is on the wing in most seasons from the beginning of May to the middle of June. In warm seasons it frequently occurs as early as the middle of April, and Tutt mentions that in the abnormally hot spring of 1893, "many species . . . had emerged long before their usual time. While *Pieris rapae*, *P. brassicae*, and *Euchloë cardamines* had produced imagines in March, so that full-

fed larvæ and pupæ were everywhere abundant in May and June, other over-wintering pupæ of the same species, kept under identical conditions, still remained as pupæ in June, and we were at this time in possession of over-wintering pupæ, eggs, larvæ, and pupæ of the year, all at the same time, of those particular species." Neave records (*Ent.*, xlv., p. 317), a very small ♂ emerging on October 2nd, 1913. all the other imagines from the same lot of larvæ having emerged between April 24th and June 9th. He also records (*Ent.*, xlvii., p. 181), another butterfly, a ♀, from the same lot of larvæ (given him on June 20th, 1912), emerging on May 20th, 1914, having remained in the pupal state over two winters. This observation lacks precision, as Neave had already stated that all the imagines had emerged, but there are other records of specimens emerging after two winters of pupal life, e.g., Mitchell records examples (*Ent. Rec.*, viii., p. 12). Frohawk refers to autumnal examples in his article in *The Field*, and suggests that these are retarded emergences and not a second brood, a suggestion with which I entirely agree. I have a long list of recorded dates, but insert only those earlier than April 15th and later than June 15th.

February 29th, 1896 (teste Tunaley).

April 3rd, 1893, Stonehouse (Nash).

„ 6th, 1893, Glanvilles Wooton (Dale).

„ 9th, 1906, Tunbridge Wells (Morgan).

„ 10th, 1896, Hereford (Tutt).

„ 10th, 1911, Essex (Mathan), Kendal (Littlewood).

„ 12th, 1914, Tonbridge (Buxton).

„ 13th, 1911, Kingston (Goodman).

June 16th, 1900, Frensham (Newland).

„ 17th, 1899, — (Swain).

„ 22nd, 1898, Brecon (Jeffreys).

„ 23rd, 1891, S. Wales (Jeffreys).

„ 27th, 1896, — Tunaley (fresh).

July 1st-7th, 1881, — (Tutt).

„ 3rd, 1900, Dovey Valley (Jeffreys).

„ 4th, 1906, Cornwall (Whittingham).

„ 5th, 1898, Brecon (Jeffreys).

„ 16th, 1882, — (Tutt).

August 2nd, 1896, Oxford (Shipp).

„ 4th, 1879, — (Pille).

„ 18th, 1886, St. Leonards (Field) [worn].

„ 18th, 1892, Wisley (Frohawk).

September 13th, 1886, Maidenhead (Haylock).

The last record refers to 4 ♂ ♂ and 1 ♀, and Haylock says several more were seen. This may possibly be a second brood, but I am inclined to doubt it.

HABITS OF IMAGO.—The species is generally early on the wing, from 8 a.m. to 9 a.m. being a favourite time. It is essentially a butterfly of the lanes and hedge sides, such being the situations in which its various food-plants grow. It rests from time to time on various plants, chiefly crucifers, and on *Anthriscus sylvestris*, on which it is marvellously protected, the orange patch on the forewing of the

male being completely hidden, and only the greenish tip showing. Tutt mentions a specimen settled for some time on *Lamium album* [*Ent. Rec.*, xix., p. 142]. Barrett, in an interesting passage [*Lep. Brit. Isl.*] refers to the wonderful mimicry of the insect in its larval, pupal, and imaginal stages, and remarks that such accurate mimicry in three stages of the same insect is truly marvellous. That the protection is not absolute is shown by a record in the *Ent. Rec.*, vol. xviii., of 37 imagines at rest being preyed upon by *Carabus violaceus*. Lucas records two specimens (one at Esher Common, and one found in the New Forest by Mr. H. Main) at rest on the partly uncurled tip of a frond of bracken, where the protective resemblance was remarkable (*Entom.*, xxxiv., p. 204).

The pairing habits of this species have been noted in some detail by Mr. Cecil Floorsheim, who says in an article in the *Ent. Record*, vol. xviii., p. 208, "the courting of *Euchloë cardamines*, like that of most butterflies, is a brief affair, and on two occasions this year* pairing took place so quickly in my butterfly house that, although my head was turned away from the spot only for a minute or so, there were two butterflies *in cop.* when I looked round again. Once, indeed, I nearly trod on a pair which had settled close behind me as I stooped to examine a twig.

"Coition takes place on or near the ground, and I have never observed any happening at a height of more than six inches from it. It lasts a comparatively short time, and in no case which I have observed, for more than two hours. It almost always took place between 11 o'clock a.m. and 2 p.m. *Euchloë cardamines* appears to be less sensitive to cold in this respect than other butterflies, for on Friday, April 27th, when the sun was shining, but the day too cold for *Gonepteryx rhamni* to be on the wing, I had two pairings of *Euchloë cardamines* in my butterfly house, the insects having emerged at this early time through my pupæ having been kept indoors through the winter."

He also notes (*ibid*), "Whereas the males of *Euchloë cardamines* flew off at once when the females showed unwillingness, those of *Gonepteryx rhamni* were most persistent, and the females seemed to enjoy their attentions."

The pairing of *Euchloë cardamines* ♂ with *Bapta temerata* ♀ is recorded (*Entom.*, xxi., p. 188).

Professor Meldola says (*Entom.*, xxxiv., p. 128), "Since the spring of 1899 there has been in my notes an observation which I have not ventured to publish, because confirmation was wanting respecting the interpretation which I was inclined to give to the fact in question. In the present (March) number of the *Entomologist* (p. 73), Mr. Guy A. K. Marshall has, however, arrived at a similar conclusion in the case of South African *Pieridae*. . . . At the period mentioned I noticed near Dunmow, Essex, a male *E. cardamines*, hovering round and advancing towards and receding from a ♀ of this species, sitting low down among the herbage with open wings and raised abdomen,

* 1906.—H.B.W.

precisely in the attitude described by Mr. Marshall. It seemed at first sight as though the male had been a successful suitor and that pairing would take place. The ♀ remained quite passive and in no way repelled the advances of her suitor. For more than 15 minutes the ♂ continued his evolutions, and then, without being in the least disturbed by me, the insects parted company and flew away in different directions. I was much puzzled at the time to explain how, without any other rival in the field, and with an apparently passive ♀, the courtship should have ended in this apparently fruitless way. It afterwards occurred to me, on thinking the matter over, that the passivity and attitude might have been indications that mating had previously taken place and that the new suitor had been warned off for this reason. This conclusion I now find to be in complete harmony with Mr. Marshall's wider experience."

Marshall notes (p. 74) that the wings are laid flat on the ground and directed so much backward that the forewing almost conceals the hindwing, and the abdomen is raised higher in the air. As pairing generally takes place from the side in these butterflies, such a position effectually prevents it, "and from numerous instances which have come under my notice I can have little doubt that the significance of the attitude is appreciated by the male."

Prideaux notes (*Ent.*, 34, p. 179), "In a lane near here a female specimen of *Euchloë cardamines* was seen, settled and perfectly quiescent, on a flower head of hedge-garlic mustard, when a male specimen, flying down the lane, made straight for the female, and pairing instantly ensued. A note was made of the occurrence, it being most unusual in my experience for butterflies to pair on such short acquaintance and with no previous courtship, and seems specially interesting in view of Professor Meldola's experience recorded *ante* p. 128."

I hope this paper on one of my favourite butterflies has not run to too great a length, though I fear it is somewhat longer than the usual paper, and considerably longer than the "short" paper indicated on the syllabus suggests, but though I cannot hope that the whole will interest everybody, I hope all will find something of interest in it. I have to acknowledge the willing help given to me during the progress of my work by the Rev. G. H. Raynor, Dr. R. Verity, and Messrs. R. W. Robbins, V. E. Shaw, and H. J. Turner, and by our President, Dr. E. A. Cockayne, and Mr. L. B. Prout, who very kindly assisted me in the necessary research work at a time when military duties prevented my doing it myself, and without whose help this paper could not have been completed. I cannot better conclude than with the words of Montaigne; "I have gathered a posie of other men's flowers, and nothing but the thread that binds them is mine own."

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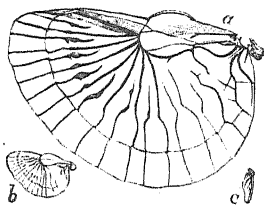
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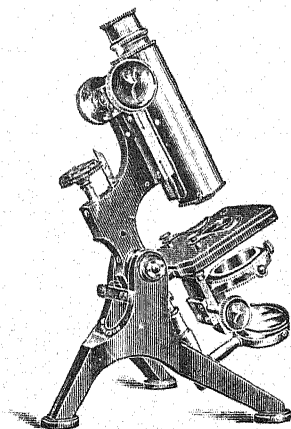
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TRANSACTIONS

OF THE

London Natural History Society

For the Year 1916.

WITH LIST OF MEMBERS.

LONDON NATURAL HISTORY SOCIETY,
HALL 20, SALISBURY HOUSE, FINSBURY CIRCUS, LONDON, E.C.
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NOTE.—The following abbreviations are used in the above lists:—Api., Apiculture; Arch., Archaeology; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Geol., Geology; Hem., Hemiptera; Hym., Hymenoptera; Lep., Lepidoptera; Mam., Mammalia; Micr., Microscopy; Neur., Neuroptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Rep., Reptilia; Zoo., Zoology.

EXTRACTS FROM MINUTES.

January 4th, 1916.—EXHIBITS.—Mr. W. E. King, a melanic ♀ *Hibernia defoliaria* from Epping Forest. Mr. L. Prout, *Larentia salicata* from Wales, apparently differing from the Scottish form. Mr. P. J. Hanson, skins of *Larus canus* (Common Gull) immature, and *Larus ridibundus* (Black-headed Gull). Mr. W. E. Glegg, on behalf of Mr. C. L. Collenette, skin of the chestnut-headed Bee-eater from Penang. Mr. J. Ross, groups of sporangia of the mycetozoon *Collocladum oculatum*, among small scattered lichen on oak bark, and on liverwort and moss which grew on an oak log. Mr. L. J. Tremayne, galls and fungus on *Buxus sempervirens*.

COMMUNICATIONS.—Mr. Glegg reported numbers of *Nyroca ferina* (Pochard) and *Querquedula crecca* (Teal) on Walthamstow reservoirs. Mr. Austin had observed *Emberiza schœniclus* (Reed bunting) in Epping Forest (Monks' Wood, etc.) eating the seeds of the grass *Molinia varia*. Mr. F. J. Stubbs stated that Reed buntings sleep in numbers at a pond at Birch Hall, Theydon, but are not seen there during the day, being then out in the Forest.

LECTURE.—Mr. F. J. Stubbs gave a lecture, entitled, "The London Gulls," illustrated with some excellent lantern slides. An abstract of the lecture is printed in these Transactions.

January 18th.—EXHIBITS.—Mr. W. E. King, a series of *Acontia luctuosa* and *Salebria semirubella* and var. *sanguinella* from Horsley. Mr. A. W. Bacot, living examples of the eggs, larvæ, pupæ and imagines of the mosquito *Stegomyia fasciata* and specimens of some of its near allies.

Mr. F. G. Mann, 21, Thurlby Road, West Norwood, was elected a member.

LECTURE.—Mr. A. W. Bacot, F.E.S., delivered a lecture, with lantern slides, on *Stegomyia fasciata* (callopis), the host of the organism of yellow fever, and the principal agent in spreading the disease; he had recently made a special study of the insect at Sierra Leone. A remarkable feature of its life-history is the irregular hatching of the eggs, which may take place in 24 hours or be postponed for several months. Numerous experiments were made to discover the cause of these variations, and it appeared that the presence of moisture containing suitable food material was often an important factor. The imago is long-lived, of unobtrusive habits, fond of lurking in dark corners; it became infected by feeding on a person suffering from the disease, and could then pass it on to persons subsequently bitten; hence the occurrence of case after case on certain ships which carried infected mosquitos with them. Mr. Bacot gave an account of the

American work on the disease. The organism of yellow fever has not yet been found. The distribution of *Stegomyia* is world-wide within the warmer regions of the globe, but special conditions of temperature appear necessary to the life of the yellow fever germ, and the disease is not so wide spread as the fly.

A vote of thanks was unanimously given to Mr. Bacot.

February 1st.—COMMUNICATIONS.—Mr. W. E. King announced the capture of four ♀ *Apocheima hispidaria* at Epping on January 30th, a very early date. Mr. Glegg stated that he was informed by Miss Gardiner, Secretary of the Royal Society for the Protection of Birds, that *Dryobates major anglicus* (Great Spotted Woodpecker) had occupied nesting boxes in Richmond Park in 1914 and 1915, and was believed to have bred successfully in 1915.

ANNUAL EXHIBITION.—Dr. Cockayne, a long series of gynandromorphous *Agriades coridon*, showing androconia on the small side, ab. *roystonensis*; a bilateral gynandromorph, a specimen showing combination of ab. *roystonensis* and ab. *semisyngrapha*, and a specimen without either blue scales or androconia on the small side. Yellow *Callimorpha hera* (= *quadripunctaria*), var. *lutescens* and *C. dominula* var. *rossica*. Unique yellow form of *Spilosoma fuliginosa* with yellow abdomen, and a pair of yellow *Saturnia pavonia*. A form of *Psilura monacha* with yellow replacing pink and two intermediates, and a yellow *Zygana filipendula*. Mr. H. B. Williams (per Dr. Cockayne), gynandromorphs of *A. coridon*, including a gynandrous specimen of ab. *semisyngrapha*. Mr. L. W. Newman, a gynandromorphous *Vanessa c-album*, left side ♀, right ♂, bred from Wye Valley in 1915. Two series of water-colour drawings of varieties and aberrations of lepidoptera bred by him in recent years. Mr. V. E. Shaw, a series of *Eupithecia extensaria* bred May, 1914, from Norfolk larvæ. *Vanessa urticae*, var. *atrebatensis*, captured 29th August, 1905, also a specimen with very small central spots to forewings; another form with usual black patch on inner margin of forewing absent, the central spots conspicuously large. Mr. W. B. Pratt (per Mr. H. Worsley Wood), two melanic *Cosymbia pendularia* and var. *subroseata* from Oxshott. Mr. H. Worsley Wood, a cabinet drawer containing a long series of *Xanthia ocellaris* with its abs. *lineago*, *intermedia* and *gilvrescens*, the last showing a great range of variation in markings and colour. A long series of *X. fulvago* from Wimbledon, including some very aberrant forms. A series of *X. gilvago*, including light (typical) forms and the usual British form ab. *suffusa* Tutt, very light forms of the same insect from Vienna, and the Asiatic form from Russian Turkestan. A possible hybrid *gilvago* × *ocellaris* Bkh. from Vienna, *X. ocellaris* from Algiers, and a closely allied *Xanthia* sp. from the same locality. *X. erythrargo* Warren, a very beautiful yellow form from Buda-Pesth. He mentioned that Mr. Bernard Cooper had in his collection a pair of the more usual smaller and redder form of this insect taken (or said to have been taken) in East Kent. This is a new addition to the British list, and though the date supplied is insufficient for its immediate acceptance, there is no inherent improbability in its occurrence here. On the

Continent it appears to be very local and rare, and so may well have been overlooked in these Islands. *Bupalus piniaria*, an aberrant form with the left hind wing bleached, bred from Oxshott, 1915. Mr. F. G. Mann, a *Spilosoma lubricipeda* ab. with coloration of darkish buff, a most conspicuous ab., bred from Norwood larva. Mr. G. T. Porritt, *Chloria suffrenata* from West Yorkshire, with vars. *piceata* and *porritii* and the Dover form. Mr. W. E. King, *Cosymbia pendularia* and a form approaching var. *subroseata* from Oxshott. Mr. J. Riches several, abs. and vars. of *Abraeus grossulariata* bred during the last few years from North London larvæ; (for Mr. Dewey, of Eastbourne) *Vanessa urticae* var. *atrebatensis* bred in 1915; (for Mr. Mutch) several vars. of *A. grossulariata*, *nigrofasciata*, *melanotoxata*, and a form approaching *albomarginata*. Mr. A. W. Mera, melanic *Psilura monacha* bred during the last three years from North Kent and Ringwood after several years of selection; also typical specimens from Hertfordshire. Mr. H. Loney, a series of very variable *Melanippe fluctuata* bred from North London larvæ; *Epinephele tithonus* with hindwings wholly suffused (Devon, 1915); *V. urticae* (somewhat crippled), the hind wings wholly suffused with black; two specimens of the fly *Bombylius major* from Horsley.

February 15th.—EXHIBITS.—Tiger and ermine moths. Dr. Cockayne, series of *Nemeophila plantaginis*, including ♀♀ with yellow abdomen, red abdomen, and red abdomen and red hindwings, and a ♂ var. *hospita*; *Spilosoma menthastris*, including melanic examples; *S. lubricipeda* showing radiated forms with pale fringes, intermediate, and completely black fringes; seven species of *Spilosoma* from Japan (including *menthastris*), and one from Darjeeling. Mr. A. W. Mera, a long series of British species, including many forms. Mr. L. W. Newman, a fine bred series of *C. dominula* var. *rossica*. *N. plantaginis* from Sligo, including one ♀ with red abdomen. Mr. H. Worsley Wood, a good series of *S. mendica* var. *rustica* from Co. Donegal and Cork; also *P. monacha* with yellow body bred in 1910. Mr. W. E. King, a good melanic ♀ *Hemerophila abruptaria* lately emerged. Mr. J. Riches, series of *S. lubricipeda*, including radiated forms, of *A. caja* and *S. menthastris*. Mr. C. H. Williams, a variable series of *A. caja*, including a form with yellow hindwings. Mr. J. Ross, the moss *Porotrichum alopecurum* in fruit.

COMMUNICATION.—Mr. A. W. Bacot announced some interesting results recently observed by him in studying lice (*Pediculi*). He found that a temperature of 52° Cent. killed them. He was doubtful of the specific distinctness of *P. capitis* and *P. humanis* (*vestimenti*). Small differences can be detected, but they interbreed freely and the eggs are fertile. He had not yet proved the fertility of the hybrids.

PAPER.—Mr. C. C. Fagg, of the Croydon Natural History Society, read a paper on "Regional Survey," illustrated by maps, lantern slides and photographs. An exhaustive and accurate survey of a given district was pleaded for. Starting from geology and meteorology as the great determinants of the physical character and the inhabitants of a region, Mr. Fagg showed these could be examined and recorded,

and the completed record, if such were ever possible, would form a connected picture of the region from geological times to the present day, and even give valuable indications of future lines of development. Thus geology, meteorology, hydrography, palæontology, contours, vegetation, all forms of animal life, population, communities, history, government, communications, industries and other factors could be surveyed and recorded, and the most graphic form of records in most cases was undoubtedly large scale maps.

March 7th.—EXHIBITS.—Hawk moths. Dr. Cockayne, British, *Amorpha populi*, ten gynandromorphs, one with male gonads only, three with female, three with both male and female gonads, but all having accessory genital organs of both sexes; *A. hybridus* Stephens, six, including two females (gynandromorph): *A. populi*, pink, dark and buff. Foreign, *Acherontia lachesis*, *A. atropos*, *Sphinx convoluti*, *Macroglossa pyrrhosticta*, *M. corythus*, *M. sylvia*, *Rhopalopsycha regulus*, *R. nycteris*, *Cephanodes hylas*, *Hemaris fuciformis* var. *radians* (Japan) with British to compare, *Pergesa epeior*, *Hippotion electus*, *Theretia clotho*, *alecto*, *japonica*, sp. (?), *Rhagastes mongolianus*. He stated that *A. lachesis* squeaks loudly and that *M. corythus* makes a loud humming sound in flight. Mr. H. Worsley Wood, *Macroglossa stellatarum*, including ab. with unicolorous dark hindwings. Mr. A. W. Mera, a drawer of British species, including *S. convoluti*, *galii* and *livornica*; an unnamed species from the neighbourhood of the Docks, and species from Sierra Leone. Mr. Sydney Whicher (a visitor), a fine series of *Amorpha hybridus* (*ocellatus* × *populi*). Mr. C. H. Williams, *S. galii* from Deal and *S. pinastri* from Aldeburgh, Suffolk. Mr. G. T. Porritt, varieties of *Abraaxas grossulariata*, two with broad yellow bands, one generally suffused with yellow scales, and one var. *variegata*. Mr. W. E. Glegg, skins of *Gallinago gallinago* (Common snipe) and *Limnocryptes gallinula* (Jack snipe) from Edmonton, February 12th, 1916. A ♀ *Marca penelope* (widgeon) was obtained at the same time. He also reported nine *Querquedula crecca* (teal) at Walthamstow reservoirs on February 19th, and ten *Podiceps fluitans* (dabchick) there on March 5th.

Mr. R. T. Bowman was elected a member.

PAPER.—Sir R. Armstrong-Jones read a paper on "A Visit to Tunis and Carthage," illustrated by numerous lantern slides. He gave an interesting description of Tunis, where an old Arab city, without wheeled traffic or any modern conveniences, exists within the modern Europeanized and progressive French settlement. The striking feature of the population was the extraordinary mixture of races and types. Very few traces of ancient Carthage are now visible, but the site can be mapped out and certain remains have been excavated. Large numbers of interesting relics of the ancient city and of the early Christian era there have been found. The old port of Carthage, an artificial harbour, still remains.

A hearty vote of thanks was accorded the Lecturer.

March 21st.—EXHIBITS.—Dr. Cockayne, a series of *Abraaxas sylvata* from North Lincolnshire, 1915, one being markedly asymmetrical, and

for comparison specimens from Chalfont Road, and one ab. *suffusa*, Tutt, one ab. *absenta*, Tutt, and a gynandromorph from North Lincolnshire, 1899. Mr. L. W. Newman, larvæ of *Abraxas grossulariata* taken from *Eranthis* in the open garden practically full-fed. Mr. W. King, a fine series of *Rumicla phlaea*, mostly from Epping Forest, including ab. *alba*, ab. *schmidtii*, and five ab. *radiata*. Mr. Bishop, leaves of *Taraxacum erythrospermum* from Surrey galled by an eelworm (?), and also the eelworm-like animal extracted from the gall by Mr. Burkill, with drawings of the same magnified—apparently the first British record.

PAPER.—Mr. A. W. Mera read a paper entitled, "Fifty Years' Reminiscences and Contrasts." He gave his own personal experiences as a lepidopterist, chiefly in the neighbourhood of London, and particularly in the now vanished collecting grounds of Hammersmith marshes. A mournful feature to the collector was the depletion of collecting grounds formerly rich in good species.

Mr. B. Cooper added personal reminiscences of the New Forest within the same period.

April 4th.—EXHIBITS.—Mr. W. King, specimens of *Apocheima hispidaria* showing a marked melanic tendency, and of *Phigalia palaria* showing melanic tendency but to a slighter extent. Mr. C. Nicholson, Coleoptera, *Cryptosephalus aureolus* and *Oedemera nobilis* from flowers at Pitchcombe, Glos., June, 1915; *Malthodes marginatus* beaten from willow, near Haslemere, May 30th, 1915, and *Triplax russia* and *Megacronus inclinans* from old logs Monk Wood, Epping Forest, November, 1915. *M. inclinans* is rare in this country, and has been recorded from Epping Forest only three or four times within the last 25 years. Hemiptera, *Pantilius tunicatus*, a local insect captured by Mr. Tremayne at Oxshott, October, 1915; *Calocoris scarguttatus*, common on flowers of *Horaceum* at Pitchcombe, Glos., June, 1915; *Idiocerus adustus* and *Pbiariola culiciformis*, captured in bedroom September, 1915, and January, 1916; all these are plant bugs. Hymenoptera, *Salix fuscus*, a sand wasp from Grayshott, May, 1915, and *Anthidium manicatum*, a solitary bee, taken on woundwort and other flowers in garden at Hale End, July, 1914 and 1915; the male is larger than the female. Trichoptera, *Limnophilus lunatus*, captured at light in sitting room at Hale End, August, 1915. Lepidoptera, *Physis betulae*, bred from larva, found feeding between spun-up birch leaves near Haslemere, May, 1915; emerged June 22nd.

Mr. E. B. Bishop, Herbarium specimens of plants, collected in 1915 by himself unless otherwise stated: *Papaver hybridum*, Linn., Merrow, Surrey, collected Mrs. C. L. Wilde; *Barbarea stricta*, Andr., River Thames, near Kew Gardens, collected C. S. Nicholson; *Sisymbrium Sophia*, Linn., Earls Barton, Northants; *Lepidium rudemale*, Linn., Bramley, Surrey; *Iberis amara*, Linn., Loosely Row, Bucks; *Viola Curtisii*, Forster, Barmouth, Merioneth; *V. lutea*, Huds. f. *amoena* Symons, near Barmouth; *Saponaria vaccaria*, Linn., Ditchling, Sussex, collected L. J. Tremayne; *Silene dichotoma*, Ehrh., St. Martha's Hill, Surrey, collected R. M. Kennedy; *Spergularia rupestris*, Lebel, Harlech Castle, Merioneth; *Geranium sanguineum*, Linn.,

Barmouth; *G. rotundifolium*, Linn., Old Marston, Oxon, and Great Harrowden, Northants, collected Mrs. Wilde; *G. robertianum*, Linn., var. *purpureum*, Vill., Hayling Island, Hants, *Erodium moschatum*, L'Hérit, Shirehampton, Glos., collected Miss I. M. Roper; *Oralis stricta*, Linn., Woking, Surrey, collected W. Biddiscombe; *Trifolium striatum*, Linn., var. *erectum*, Leight, Gomsball, Surrey; *T. repens*, Linn., var. *phyllanthum*, Seringe, near Bramley, Surrey; *T. resupinatum*, Linn., Aldrington, Sussex; *Lotus corniculatus*, Linn., var. *crassifolius*, Pers., Barmouth; *Astragalus glycyphyllos*, Linn., near Puttenham, Surrey, collected Mrs. Wilde; *Vicia orobus*, D. C., near Barmouth; *Lathyrus sylestris*, Linn., near Barmouth; *Patentilla norvegica*, Linn., near Witley, Surrey; *P. argentea*, Linn., Puttenham Heath, etc.; *Achillea vulgaris*, Linn., var. *alpestris*, Pohl., near Diphwys, Merioneth; *A. vulgaris*, var. *silicaulis*, Buser, near Loosley Row, Bucks; *Eupatorium tenuissimum*, Linn., Hayling Island.

COMMUNICATIONS.—Mr. Bishop gave eleven instances he had received from Miss Roper of mistletoe growing on oak—five in Herefordshire, two Gloucestershire, and one each in Somerset, Devon, Hants and Surrey, the last-named at Burningfold Farm, Dunsfold. Mr. Austin recorded *Limnocyrtus gallinula* (Jack snipe) at Walthamstow reservoirs on February 26th, 1916.

PAPER.—Mr. H. J. Burkill, M.A., F.R.G.S., read a paper on plant galls, dealing with the different causes producing galls, viz., fungi, eelworms, insects of various orders, and mites. A short classification of the different kinds of galls was given, and some problems requiring investigation and solution were pointed out.

April 18th.—EXHIBITS.—Mr. W. King, *Brephos parthenias* from Epping Forest, 1916, one with pale hindwings and one with orange markings on forewings. Mr. W. E. Glegg, skin of *Charadrius apricarius* (Golden plover) obtained at Loughton in February, 1916.

Mr. E. B. Bishop, Herbarium specimens of *Galium verum*, Linn., var. *maritimum*, D.C., Dyffryn, Merioneth; *Valeriana officinalis*, Linn. (*mikanii*, Syme), East Clandon, Surrey; *Filago apiculata*, G. E. Smith, near Shackleford, Surrey; *Gnaphalium sylvaticum*, Linn. (a very fine specimen), near Cutt Mill, Surrey; *Pulicaria vulgaris*, Gaertn., Stringer's Common, Surrey, collected R. M. Kennedy; *Ambrosia artemisiifolia*, Linn. (a casual), Abbey Wood, Kent, collected J. E. Griffin; *Anthemis tinctoria*, Linn., var. *discoidea*, Willd., Godalming, Surrey, collected Mrs. C. L. Wilde; *A. arvensis*, Linn., Tuesley, near Godalming, collected Mrs. Wilde; *Senecio saracenicus*, Linn., near Minehead, Somerset, collected W. Simpson; *Hieracium pellucidum*, Laestad, near Godalming; *Taraxacum erythrospermum*, Andr., near Crooksbury, Surrey, and Puttenham; *Phyteuma orbiculare*, Linn., near Puttenham; *Campanula latifolia*, Linn., near Mears Ashby, Northants; *Erica ciliaris*, Linn., Stoborough Heath, Dorset; *Pyrola minor*, Linn., near Woking, collected C. A. Cook; *Linonitum vulgare*, Mill, Hayling Island; *L. humile*, Mill, Hayling Island; *Primula veris*, Linn., x. *vulgaris*, Huds., near Latton Priory, Essex, collected Mrs. Tremayne; *Anchusa officinalis*, Linn., Barmouth; *A. sempercrens*, Linn., near

Chilworth, Surrey; *Myosotis sylvatica*, Hoffm., near Titsey, Surrey; *Echium vulgare*, Linn., Kimmeridge, Dorset, collected C. B. Green, a beautiful form with very pale pink flowers. Mr. H. J. Burkill, various forms of galls caused by different species of *Eriophyes* (mites), a witch's broom on hornbeam caused by a fungus, and a sketch of an abnormal spike of *Digitalis purpurea* caused by *Eriophyes* sp. (?) from Yorkshire.

COMMUNICATION.—Mr. Robbins recorded a nest of the hedge sparrow at Hale End in use for the third year in succession.

PAPER.—Mr. P. J. Hanson gave a lecture entitled, "Uncommon British Birds," illustrated by photographs taken by himself and shown through the lantern. The species mentioned included the buzzard, kite, raven, Montagu's harrier, grey wagtail, pied flycatcher, gannet, and kittiwake. Many of the photographs were exceptionally fine.

May 2nd.—COMMUNICATIONS.—Mr. A. W. Mera reported *Pieris rapae* on April 24th; Mr. L. W. Newman, *Euchloe cardamines* on April 30th, *Saturnia pavonia* on April 23rd; Mr. Austin, *Flammea flammea* (barn owl) nest with two young and one egg just hatching, Willingale, April 24th, *Ægithalus candatus roseus* (long-tailed tit) nest at Beaumont, April 30th; Mr. Glegg, *Microtus apus*, four (swifts), *Hirundo rustica* (swallow), *Motacilla raii* (yellow wagtail), and *Saricola rubicola* (stonechat) near Staines, April 21st. Dr. Cockayne found seven *Gonoptera libatrix* hibernating in a cellar in Lincolnshire; they had to pass two gratings, and were in perfect condition. Mr. L. J. Tremayne gave some notes from Chippenham, Cambs. *Hirundo rustica* (swallow), *Delichon urbica* (martin), and *Phylloscopus trochilus* (willow warbler) were seen on April 24th. A flock of *Turdus pilaris* (fieldfares) were seen on outward migration. *Gallinago gallinago* (common snipe) common in the Fen. *Cuculus canorus* (cuckoo) present, but very quiet.

PAPER.—A paper entitled, "Some Points of Interest in the Geometridæ," written by Mr. L. B. Prout, was read in his absence by Mr. V. E. Shaw. It is printed in these Transactions.

May 16th.—EXHIBITS.—The Dianthæcias. Dr. Cockayne, examples of all the British species, including *D. caesia* from Ireland and the Isle of Man, and *D. capsophila* from these places. Mr. L. A. E. Sabine, *D. barrettii* from Co. Cork, a few with melanic tendencies, one ♀ extremely pale (ochreous), a very rare form. *D. conspersa*, a variable series from North Cornwall, including dark and ochreous, also a series from Shetland Isles with extreme dark vars. *D. capsophila*, Co. Cork, bred from larvæ taken on *Spergularia rupestris* where *Silenes* do not occur, one specimen a very pale greyish form. Also *Crymodes exulis* from the Shetlands with two ♀ ♀ (rare), *Hadena adusta*, bred from Shetlands; *H. pisi*, bred from Co. Cork larvæ on bramble, with some pretty purplish forms. *H. thalassina*, bred from Co. Sligo. Mr. A. W. Mera, series of Dianthæcias with exceptionally light forms of *D. carpophaga* from Felixtowe.

Mr. H. J. Burkill, *Crataegus monogyna* galled by *Eriophyes gonio-*



NEST OF MONTAGU'S HARRIER (*Circus pygargus*).
Found in very tall reeds (about five feet high) on a large marsh in Norfolk, 31st May, 1899.

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thorax, *Quercus robur* by *Andricus curretor*, *Viola riviniana* by *Urocystis violae*, and *Pyrus terminalis* by *Eriophyes pyri* and *Aphis sorbi*.

COMMUNICATIONS.—Mr. E. B. Bishop gave a brief account of the Research Section outing at Chipperfield, Herts, from May 12th to 15th, and gave the following records: *Geum rivale* × *urbanum* (= *intermedium*), Chenies, Bucks; *Hordeum europaeum*, All. (*H. sylvaticum*), Chenies; *Cardamine bulbifera*, Crantz, near Chandler's Cross, Herts (in the Society's district), and near Chenies, in both cases locally abundant; *Paris quadrifolia*, Linn., Chenies; *Alchemilla vulgaris*, Linn., by River Chess, near Sarratt, Herts. Mr. Glegg recorded *Fulica atra* (coot) nest with four eggs and one young, *Phylloscopus trochilus* (willow warbler) nest with four eggs, and *Caprimulgus europaeus* (nightjar) at Theydon Bois, May 7th; also *Streptopelia turtur* (turtle dove) and *Acrocephalus streperus* (reed warbler) observed by Mr. F. J. Stubbs. In a letter Mr. H. B. Williams recorded *Caprimulgus europaeus* at Berkhamsted on May 2nd.

PAPER.—Mr. E. Samuelson read a paper on "Racial Europe," illustrating his remarks with maps and diagrams. Europe was peopled by the Aryan race, which in prehistoric times split into the Latin (including Greek), Teuton, Slav, Celtic and Semitic branches. He described the main physical and mental characters of each section, and laid stress on the fact that the differences which divide are infinitely less than the similarities which unite. With the aid of a large map he pointed out the distribution of the sub-races throughout Europe.

June 6th.—EXHIBITS.—Mr. W. E. Glegg, skin of *Alle alle* (little auk). Mr. Bishop, *Habenaria viridis* (frog orchis) and *Orchis ustulata* (burnt-topped orchis) from the Downs at Eastbourne, and *H. conopsea* (scented orchis) from Puttenham, Surrey. Mr. H. J. Burkill, red barnacle gall (*Andricus sieboldi*) on oak from Denham, Bucks.

COMMUNICATIONS.—Mr. Glegg recorded *Emberiza calandra* (corn bunting), between Goodmayes and Colliers Row, on May 21st; *Podiceps cristatus* (great crested grebe), on nest, Stoke Newington reservoir, May 27th. Mr. Austin, *Emberiza schoeniclus* (reed bunting), *Acrocephalus schoenobaenus* (sedge warbler), feeding young, *Acrocephalus streperus* (reed warbler), *Saxicola rubetra* (whinchat), common, *Motacilla alba* (yellow wagtail), a pair, *Riparia riparia* (sand martin), common, *Hirundo rustica* (swallow), nest, three eggs, and *Totanus totanus* (redshank), all at Cuckoo Hall Farm, Edmonton, on June 3rd; *Streptopelia turtur* (turtle dove), heard, *Columba palumbus* (ring dove), nest with two eggs, sitting, and *Luscinia megarhynchos* (nightingale), nest no eggs, Epping Forest, June 4th.

PAPER.—A paper on "British Orchids," provided by the South-Eastern Union, illustrated by lantern slides, was read by Mr. Bishop.

June 20th.—EXHIBITS.—Mr. J. Ross *Sphagnum cymbifolium* (bog moss), in very young fruit, from Epping Forest, June 17th.

Mr. A. W. Mera, an excellent collection of pupa cases of lepidoptera. Mr. A. W. Bacot, larvæ and eggs of *Stegomyia fasciata*, the

yellow fever mosquito. Mr. Marshman Wattson, pupa cases of several species of *Odonata*.

COMMUNICATIONS.—Mr. Robbins reported *Numenius arquata* (curlew), in Herefordshire.

Mr. A. J. Brown, 44, Ravendale Road, Stamford Hill, was elected a member.

September 5th.—EXHIBITS.—Mr. H. J. Burkill, *Tilia cordata* galled by a midge, *Oligotrophus reaumuriannus*, Wye Valley, the first British record, previously known in Central Europe; *Populus nigra* galled by (?) *Pemphigus vesicarius* and *P. marsupialis*, *Plantago maritima* galled by the beetle *Mecinus collaris*, Gloucestershire; *Salix fragilis* galled by the sawfly, *Cryptocampus testaceipes*, Surrey; *Acer campestre* galled by *Atrichosema acris*, Wye Valley.

COMMUNICATIONS.—Mr. Glegg read extracts from a letter from Second Lieutenant F. Reynolds, who in France had observed a pair of golden orioles in a wood that had received heavy bombardment. "They are delightful birds with neat actions and general appearance, and a short simple song or call, which consists of a melodious whistle, easily imitated." No nest was found. He also observed crested larks, hooded crows, and great reed warblers. Birds seemed fairly indifferent to bombardment. Curlews, redshank, geese, and wood pigeons had been noted flying over the trenches.

Mr. Glegg recorded: *Caprimulgus europaeus* (nightjar), reeling strongly at 8.5 p.m. in Epping Forest, June 10th; *Sylvia communis* (whitethroat), nest with five eggs, at Galley Hill, June 11th: on June 26th the nest contained nine eggs and the bird was still setting; *Dryobates major anglicus* (great spotted woodpecker), nest with young in a pollard oak, near Chingford, on June 18th. Mr. Austin, *Muscivora griseola* (spotted flycatcher), nest with five eggs, on verandah at Beaumont Manor, June 17th; *Caprimulgus europaeus*, two flushed in Great Monk Wood, and remains of an egg found, June 25th; *Lanius colurio* (red backed shrike), a pair at Strawberry Hill, with two young, July 9th; the larder was found with a warbler spitted and partly eaten; *Alcedo ispida* (kingfisher), at Connaught Water, on July 23rd. Mr. Burkill related how a young nightjar crawled like a parrot over a tweed jacket, made its purring note in any position, and took a blue-bottle fly from the hand.

PAPER.—Mr. J. Ross read a paper on "Some Common Wall Mosses," treating of *Tortula muralis*, *Grimmia pulvinata*, and *Bryum capillare*.

September 19th.—COMMUNICATIONS.—Mr. W. E. Glegg narrated the results of observations on the birdlife of the Norfolk coast, between Wells and Salthouse, including the National Trust preserve at Blakeney Point, from July 1st to 9th. Some large colonies of *Sterna hirundo* (common tern) and *Sterna minuta* (lesser tern) exist, but only one young tern (*S. hirundo*) was seen, whereas in 1914 many young of both species were seen seventeen days earlier. It would appear that the many eggs seen were a second laying, the first having been destroyed by the

high tides which accompanied the inclement weather in June. Regarding *Haematopus ostralegus* (oyster catcher), the most interesting species on the National Trust ground, some difference of opinion exists as to the fate of the two clutches laid on Blakeney Point this season, but Mr. Glegg saw a pair that undoubtedly had young about. *Tadorna tadorna* (shelduck) common, and *Platalea leucorodia* (spoonbill), one was identified.

The death of Mr. S. G. Lewis, of the Universities and Public Schools Batt. Royal Fusiliers, from wounds received at the front, was announced.

EXHIBITION.—THE NOTODONTIDÆ.—Dr. Cockayne, *Stauropus fagi*, ♂ and ♀ type, ♂ and ♀ melanic; *Cerura furecula*, ♂ and ♀; *Cerura bicuspis*, five; *Cerura bifida*, ♂ and ♀; *Ptilophora plumigera*, ♂ and ♀ pale form, ♂ and ♀ dark form; *Pterostoma palpina*, ♂ and ♀; *Notodonta dictæa*, ♂ and ♀, pale ♂ Scotland; *N. dictæoides*, ♂ and ♀; *N. dromedarius*, ♂; *N. sicæac*, ♂; hybrid *N. sicæac*, ♂ × *N. dromedarius*, ♀; *Lophopteryx cuculla*, *L. carmelita*, ♂; *Drymonia trimacula* (*diodonæa*), ♂; *D. chaonia*, ♂ and ♀; *Asteroscopus nubeculosa*, ♀; *A. sphinx* (*cassinea*), *Lophopteryx camolina*, three; *L. trepida*, ♂ and ♀; *Pygaera curtula*, *P. pigra*, *P. anachoreta*. Asiatic Notodontidæ: *Pygaera timoniorum*, three, Japan; *Microphalera grisea*, two, Japan; *Spatalia plusiotis*, Japan; *Fentonia sigmata*, Japan; *Rhynco-phalera flarescens*, Japan; *Lophopteryx camolina*, Japan; *Drymonia trimacula*, Japan; *Antheria exanthemata*, Ceylon; *Pydna obliqua*, Java; *Nerice bipartita*, Japan; *Hyperaeschra tenebrosa*, Japan.

Mr. King, larvæ (living) of *N. dromedarius*, *L. camolina*, *Drepana falcatoria*, and *D. lacertinaria*, beaten from birch at Oxshott. Mr. B. Cooper, a very variable bred series of *Amorpha populi*, and a living ♂ *Hibernia defoliaria* (early date).

Mr. C. S. Nicholson, herbarium specimen of *Carduus tuberosus*, from Glamorgan, where it is abundant over a small area. This thistle has been found in Britain only in Glamorgan and in Wiltshire where it is possibly now extinct. It has been supposed to be a hybrid (*C. pratensis* × *acaulis*), but it is reproduced freely from seed, and in cultivation beside the two species named remains perfectly true and distinct from either. It appears to be a true species.

October 3rd.—The death of Second Lieutenant Frank Reynolds, Sherwood Foresters, Trench Mortar Battery, killed in action, September 13th, was announced.

EXHIBITS.—Dr. Cockayne, a series of the larger Bombyces, *Gastropacha cerroidifolia*, Nikko, Japan; *Odonestis albomaculata*, three, Nikko, Japan; *Melanastria segregata*, two, ♀ taken in the Emperor's Palace at Kyoto; *Odonestis askoldensis*, three, Japan; ? sp., Tosari, E. Java; *Actias luna*(?), Japan; *Eupterote fabia*, Ceylon, Kandy; *Oricula* sp.?, Djokja, Java; *Loepa katinka*, hills of E. Java; *Eupterote testacea*, hills of E. Java; *Messata vialis*, two, hills of Ceylon; *Sangatissa sub-uvifera*, hills of Ceylon; *Apha tychoona*, two, Japan. Also a series of British moths having on them the pollinia of orchids, mainly the spotted orchid—*Apamea basilinea*, *Habrostola urticae*, *Hadena dentina*,

Xylephasia rurea, *Plusia gamma*, three, all from Tongue, Sutherland, *Plusia gamma*, Tongue, and *Plusia bractea*, Enniskillen, both with butterfly orchis pollinia on left eye.

Mr. W. E. King, a series of *Xanthia fulvago*, bred from Horsley larvae, including abs. *flavescens*, Esper, *imperfecta*, Tutt, *cerago*, Tutt, and *aurantia*, Tutt. Mr. A. W. Mera, a series of *Papilio asterias* from Ontario. Mr. L. W. Newman, a series of *Agriades thetis* (*adonis*), several slate grey males, and one showing a curious mixture of slate-grey and brilliant blue. All the specimens were taken at one spot. The grey form has occurred before, but the mixed specimen is unique. The structure of the grey insects is extremely delicate: they have to be taken drying their wings, otherwise they are invariably damaged. Also a series of *Agriades coridon*, with the vars. *roystonensis*, *inequalis*, and *impar*, five having left side small wings and seven having right side small wings, and several ♀ specimens with small blue streak, also two with tawny streaks on the usual ground colour.

Mr. L. J. Tremayne, a sprig of *Fagus sylvatica* var. *laciniata* from an old garden at Enfield, probably formerly part of Enfield Chase. Nearly all the leaves on the tree were lacinate, but two sprays had typical leaves. Dr. Cockayne said that on an estate in Aberdeenshire where beech seedlings were reared, a small percentage of lacinate-leaved sports always occurred. Mr. L. B. Hall, *Cypripedium calceolus* from Kandersteg, Switzerland. Mr. H. J. Burkill, two forms of twigs of *Salix fragilis* from Surrey. The narrow-leaved form was free from midge galls, while nine twigs of the broad-leaved form yielded 23 pupæ of a midge from the buds or the base of the leaf stalk, thus suggesting that there might be some difference between the two forms to account for the absence of galls in one case and their presence in the other.

COMMUNICATIONS.—Mr. Burkill records the capture of a ♂ *Synaptetrum sanguineum* at Chiswick on October 1st. This dragon fly is not recorded for Middlesex in Mr. W. J. Lucas's Book. Mr. W. E. Glegg announced the following bird observations in Deeside (Aberdeenshire) and the neighbourhood from July 15th to 17th; Banchory Devenick, *Phylloscopus trochilus* (willow warbler) singing, *Emberiza calandra* (corn bunting) singing, *Tetrao urogallus* (capercaillie) with two young, *Crex crex* (corncrake), also heard at Stonehaven at midnight, *Pica pica* (magpie); at Clunie Water and Blackwater, *Totanus hypoleucos* (common sandpiper); at Banchory Devenick, Ballater and Clunie Water, *Haematopus ostralegus* (oyster-catcher); at Findon, *Delichon urbica* (martin), apparently nesting on the cliff face, *Anthus petrosus* (rock pipit) nesting, *Falco peregrinus* (peregrine falcon) nesting, large nesting colony of *Larus argentatus* (herring gull), 13 *Corvus cornix* (hooded crow), *Columba livia* (rock dove), *Sula bassana* (gannet) in first year's plumage, and *Somateria mollissima* (eider duck) adult and young: at the Spittal of Glenshee, *Oenanthe oenanthe* (wheatear). Mr. S. Austin, *Podiceps fluvialis* (little grebe), two, at Connaught Water on September 17th.

PAPER.—Mr. E. B. Bishop read a paper, "More Notes on Orchids," supplied by the South-Eastern Union and illustrated by fine lantern slides.

October 17th.—EXHIBITS.—Dr. Cockayne, a box of nearly all the British species of lepidoptera having wingless females, viz., *Himera pennaria* ♂ and ♀s, *Lycia hirtaria* ♂ and ♀, *Lycia* hybrid *pilzii*, Standfuss (*L. hirtaria* ♂ × *P. pomonaria* ♀) ♂s and ♀s, *Poecilopsis* hybrid *helenae* (*P. pomonaria* ♂ × *Ithysia zonaria* ♀), *Poecilopsis* hybrid *langei* ♀ (*I. zonaria* ♂ × *P. pomonaria* ♀), *Ithysia* hybrid *harrisoni* ♂ and ♀s (*I. zonaria* ♂ × *L. hirtaria* ♀), *Poecilopsis* hybrid *smallmani* ♂ and ♀ (*P. lapponaria* ♂ × *I. zonaria* ♀), *Ithysia* hybrid *merae* ♂ and ♂s (*I. zonaria* ♂ × *P. lapponaria* ♀), *Ithysia zonaria* ♂s and ♀s, *Poecilopsis lapponaria* ♂s and ♀s, *Apocheima hispidaria* ♂ and ♀s, *Phigalia pedaria* ♂s and ♀s, one ♂ melanic, *Erannis defoliaria* ♂ and ♀s, *Agriopsis marginaria* ♂ and melanic ♂, and ♀s type and melanic, *Agriopsis leucophaearia* type ♂, and abs. *marmorinaria* and *merularia*, and ♀s, *A. aurantiaria* ♂ and ♀s, *Alsophila aescularia* ♂ and ♀s, *Cheimatobia brumata* ♂ and ♀s, *C. boreata* ♂ and ♀s, *Theria rupicaprararia* ♂ and ♀s, *Aleucis pictaria* ♂ and ♀, ♀ winged like ♂ though closely related to *T. rupicaprararia*, *Gnophos obfuscaria* ♂ and fully-winged ♀ (the Continental *G. operaria* has an almost wingless ♀), *Orygia antiqua* ♂ and ♀s, *Hepialus lupulinus* ♂ and ♀ (*H. pyrenaicus* has an apterous ♀), Psychid ♂ sp.? Ceylon, Psychid ♀ wingless and legless, Japan?, from larva found on dwarf cedar in London, bred August, 1916, and pupa cases of *I. zonaria* to show that in the ♀ they have fully-formed wing covers.

Mr. A. W. Mera, *O. antiqua*, *O. gonostigma*, *P. lapponaria*, *A. hispidaria*, *T. rupicaprararia*, *A. aurantiaria*, *E. defoliaria*, *A. leucophaearia*, *A. marginaria*, *C. brumata*, *C. boreata*, also *Ithysia* hybrid *harrisoni* and *Ithysia* hybrid *merae*. Mr. B. Cooper, ♀ specimens of *P. pedaria* (York), *I. zonaria* (Cheshire), *A. hispidaria* (New Forest), *P. lapponaria* (Rannoch), and *Ithysia* hybrid *harrisoni* with three wings only. Mr. A. J. Willsdon, *A. hispidaria*, *P. pedaria*, *T. rupicaprararia*, *A. aurantiaria*, *E. defoliaria*, *A. marginaria*, *I. zonaria*, *A. aescularia*, and *C. brumata*. Mr. J. Riches, *O. antiqua*, *O. gonostigma*, *I. zonaria*, *A. aescularia*, *A. aurantiaria*, *A. marginaria*, and *P. lapponaria*. Mr. W. E. King, ♂ and ♀ of *I. zonaria* from Wallasey, and ♂ and ♀ of the following from Chingford: *A. hispidaria* and a melanic form, *P. pedaria* and var. *monacharia*, *A. aescularia*, *A. leucophaearia* and var. *marmorinaria*, *C. brumata*, *C. boreata*, *A. aurantiaria*, *A. marginaria* and var. *fusca*, and also a fine gynandromorph left side ♂ right side ♀, *E. defoliaria*, a very variable series, including ab. *obscurata*, and two with the posterior wings very much suffused and darker than any previously taken.

Mr. H. J. Burkill, *Corylus avellana* galled by *Stictodiplosis corylina*, collected L. J. Tremayne, Surrey; *Malva moschata* galled by *Eriophyes gymnoproctus*, collected L. J. Tremayne, Surrey, on the Lepidoptera Committee's outing, and *Lychnis dioica* galled by *Contarinia steini*, collected H. J. Burkill, Bucks.

PAPER.—Dr. T. A. Chapman, F.Z.S., F.E.S., read extracts from a most valuable and exhaustive paper on the "Apterous Condition in Lepidoptera," which is printed in these Transactions. An interesting discussion followed.

November 7th.—EXHIBITS.—Dr. Cockayne, a fine specimen of *Attacus atlas* ♀, about ten inches in wing expanse, from Java. Mr. C. H. Williams, a variable series of *Lasiocampa quereus* from Perth, Church Stretton and North Devon, an ab. *rufa* from Inverness, and a series of *Endromis versicolor* from Sevenoaks. "Mr. G. T. Porritt, the olive-banded form of *L. quereus*, and a gynandromorph of the same species from the moors near Huddersfield; also a yellow ♂ of *Cosmotriche potatoria* from Cambs. Mr. V. E. Shaw, *L. quereus* from Kent, and var. *callinice* from the Isle of Arran. Sec.-Lieut. H. B. Williams, insects collected in the Chilterns in 1916, including a nice underside ♀ *Polygonatus icarus* with forewings striated; a varied series of *Brenthis euphrosyne*, a series of *Asthenes blomeri* from Chalfont, where ♀s were fresh on July 21st, a rather late date (Dr. Cockayne recorded taking a freshly-emerged ♀ of *A. blomeri* about the middle of August), *Zygæna eridania* from Braemar, *Agriades coridon* and vars. from Royston, including a fine ♀ *obsoleta*, *semisyngrapha*, gynandromorphous forms and others; *Tosocampa pastinum* and *Abraaxas sylvata* taken July 14th, 1916, in Berks.

Mr. C. S. Nicholson, herbarium specimens of *Cynodon dactylon*, Persoon, from Penzance and St. Michael's Mount, and *Artemisia stelleriana*, Besser, from St. Michael's Mount. Mr. H. J. Burkill, gall of *Diastraphus rubi* on *Rubus* sp.?, from Surrey, on gravel, coll. Mrs. L. J. Tremayne. Mr. W. E. Glegg, photographs of (1) nesting hole of great spotted woodpecker in pollard oak, near Chingford, (2) nesting hole of woodpecker, species unknown, near Woodman's Glade, hole enlarged, tree decayed inside, this year's nest, (3) nesting hole of woodpecker, species unknown, in Long Hills, hole enlarged, tree decayed, nest several years old, 2 and 3 also in pollard oaks.

COMMUNICATIONS.—Mr. W. E. Glegg recorded a number of *Turdus iliacus* (redwing), near the Warren, on October 22nd, arrival apparently governed by food supply; *Anthus pratensis* (meadow pipit), and *Emberiza schoeniclus* (reed buntings), two flushed from patch of *Molinia varia* in Monk Wood, on November 5th.

PAPER.—Mr. R. Marshman Wattson read a paper on "English Mediaeval Monasteries," illustrated with a fine series of lantern slides, showing the costumes of the several orders, plans of monastic buildings, and pictures of such buildings and ruins as remain.

November 21st.—Mr. P. J. Hanson announced the addition of a photograph of the reed warbler's nest to the collection.

EXHIBITS.—Dr. Cockayne, *Pararge aegeria*, ♂ and ♀ of the August brood for N. Lincs., and ♂s and ♀s of the ordinary European form from North-West Spain, in October; also full-fed larvæ and three pupæ, one of the green and two of the brown form. In a dark box more than half of the pupæ were of the brown form. Mr. W. E. King, a series of *Agriades coridon*, from Dunstable, in August, including a thin scaled ♂ and broad banded ♂, three ab. *roystonensis*, one with a buff stripe, ab. *minor* ♂ and ♀, abs. *parisiensis*, *obsoleta*, *semisyngrapha*, etc. Mr. King said that he found no predominance of ♀ *A.*

coridon at Dunstable, ♂s were as common as ♀s. Mr. J. Riches, *Apamea ophiogramma*, bred from North London larvæ, 1916.

Mr. C. S. Nicholson, herbarium specimens of the rare *Polygonum maritimum*, L., from a foreshore in Cornwall. Mr. L. B. Hall, mosses mounted in celluloid cases for use in the field, including *Fontinalis squamosa*, *Hypnum cristacastrensis*, etc.

COMMUNICATIONS.—Mr. H. J. Burkill recorded a foreign phalloid fungus (*Lysurus* sp.?) at Chiswick, on a bank where stable refuse was deposited.

PAPER.—Mr. J. A. Simes read a valuable paper on "Aspects of Bird Life in Europe," which is printed in these Transactions. A discussion followed.

December 5th.—COMMUNICATIONS.—Mr. W. E. Glegg reported *Turdus iliacus* (redwing) singing, near Fairmead, on December 2nd; at Walthamstow reservoirs, *Querquedula crecca* (teal), 20, on December 2nd. Mr. Austin, *Limnocyptes gallinula* (jack snipe), at Fairmead, on November 26th.

OFFICIAL BUSINESS.—The Report of the Council, the Treasurer's Accounts, the Report of the President of the Research Section, the Librarian's Report, and the Report of the Oological Curator, were presented and adopted.

The best thanks of the Society were presented to Mr. W. E. Glegg for his services as Librarian on his retirement from that office.

The following officers were elected:—

PRESIDENT.—Dr. E. A. Cockayne.

VICE-PRESIDENTS.—Rev. C. R. N. Burrows, Messrs. A. W. Bacot, M. Greenwood, jun., F. J. Hanbury, A. W. Mera, L. B. Prout, and R. W. Robbins.

LIBRARIANS.—W. H. Bell and A. L. Mera.

CURATORS.—S. Austin, C. S. Nicholson, and L. W. Newman.

PRESIDENT OF RESEARCH SECTION.—E. B. Bishop.

TREASURER.—F. G. Dell.

SECRETARIES.—V. Eric Shaw and J. Ross.

Messrs. H. J. Burkill, L. B. Hall, P. J. Hanson, W. E. King, and L. J. Tremayne, members of the Council.

December 19th.—EXHIBIT.—Mr. J. Ross, specimens of the hepatic *Ptilidium pulcherrimum* from Epping Forest, probably a new record for South-Eastern England, the nearest stations previously recorded being Derbyshire and South Somerset. The plants exhibited were collected from the trunk of an oak in a damp situation; the trunk of the tree slants to the south, and the plants were on the north side.

COMMUNICATIONS.—Mr. Glegg reported *Coccothraustes coccothraustes* (hawfinch), a single bird, near the Warren, Epping Forest, on December 10th, sitting boldly on the top of a small bush.

Mr. T. H. Briggs, Rock House, Lynmouth, Devon, was elected a member.

PRESIDENT'S ADDRESS.—Dr. Cockayne read his address as President for 1916. The address is printed in these Transactions.

COUNCIL'S REPORT FOR 1916.

Another year of war conditions has been passed through; it has been a period of restricted activity for the Society because of the conditions and because of the enlistment of more of our members in the Army. Over thirty members of the Society are now, or have been, on active service.

With great sorrow we record the loss of Second-Lieutenant Frank Reynolds, of the Sherwood Foresters, and Mr. S. G. Lewis, of the Universities and Public Schools' Batt. Royal Fusiliers. Both these members were keen students of bird life, and Second Lieutenant Reynolds took a particularly active interest in the work of the Ornithological Research Committee, and in his branch was a worker of great promise. These are the only losses at the Front of which your Council has knowledge at present, but several others of our members have been wounded; these, we are glad to say, have either recovered and are again on service, or are well on the way to recovery.

Although many members are serving in the Forces, and others are too busily engaged in national work to follow their usual pursuits in natural history, the Society has been able, largely through the efforts of a nucleus of members over military age, to continue its work.

The Branch at Woodford has suspended the holding of meetings. Many members associated with the Branch were of military age, and their enlistment and the absorption of others in work arising from war conditions so reduced the numbers attending meetings, that it became inadvisable to continue. The Chingford Branch, with Canon Russell as Chairman, and Mr. E. Samuelson as Secretary, has held successful and encouraging meetings despite the adverse circumstances.

A series of valuable meetings has been held at Salisbury House, notwithstanding the decision to rely almost entirely on our own members for papers. The members studying the Lepidoptera have made numerous fine exhibits, and plant galls have been frequently shown, some of the galls being new records for Britain and others rare.

The work of the Research Section has perhaps suffered less than that of the Society generally from the loss of members on service, though the Lepidoptera Committee has been deprived of the help of prominent members. A Plant Gall Committee has been formed, and through the efforts of some enthusiastic members a good start has been made. Mr. Burkill, who is Secretary, has had much work thrown upon him in identifying galls that other members have collected.

Although this sphere of new work has opened, it is not to be expected that any advance movement by the Society can be made at present. Generous help has been given by many of the older members in time, energy and money, and the publication of the Transactions has been entirely met by subscriptions. To those members the Council would tender its special thanks, and although recognising that the present is no time for expansion, would welcome suggestions for that progress and development that it is hoped to achieve when normal times return.

RESEARCH BOARD. ANNUAL REPORT for 1916.

1. The Research Board for 1916 has comprised Mr. E. B. Bishop as President, Mr. R. W. Robbins, Mr. W. E. Glegg and Mr. S. Austin, with Mr. L. J. Tremayne as Secretary.

2. Reports of the various Committees are annexed. Practically all of them have been seriously handicapped during the year by war conditions and by the various calls which the war has made upon their members. But all of them are fully alive and continuing to do useful work.

3. The Board has especially to sympathise with the Ornithological Committee in the loss of Mr. Frank Reynolds, who has recently been killed in action. He was a most promising young member, who had already done good service to his own Committee, and whose assistance the Board had hoped to procure later in other capacities.

4. The new Gall Committee referred to in last year's Report has actually come into existence during 1916, under the auspices of Mr. H. J. Burkill. The Committee has a wide field of usefulness before it, and should offer special opportunities for original research to young members who have not decided in which department of Natural History they shall specialise.

5. The second annual week-end of the Research Board was spent during May 12th to 15th at "The Two Brewers' Hotel," Chipperfield, Herts. It was in every way a success. Altogether twelve members and visitors were present for the whole or part of the time. The Botanical Records on this occasion were of considerable interest.

6. The question of providing maps of the district for the use of those who are at work upon its records has been considered by the Board during 1916. It cannot be said that this matter has yet been placed on a satisfactory footing, as this would necessitate expenses which cannot at present be met. Meanwhile, two members of the Board, Messrs. Robbins and Austin, have undertaken to mark the boundaries of the Society's district and sub-divisions on any maps which members like to send them for this purpose. The thanks of all members are due to Messrs. Robbins and Austin for undertaking this useful work, and it is hoped their offer will be widely utilized.

7. The Board has to regret the loss during the year of Mr. H. B. Williams on his going on active service, and of Mr. C. S. Nicholson on account of health; and to acknowledge thankfully the services rendered by these members in the past. It is hoped their loss will be temporary only.

8. The Board, like its Committees, has been materially handicapped by war conditions in 1916; but it has kept in close touch with all its Committees, and hopes still to be able to render them any assistance they may require. Other important matters have been receiving attention during the year, and will be further dealt with next

year if possible, but at present there is nothing definite thereunder to lay before the Council.

E. B. BISHOP, *President of the Research Section.*

ARCHAEOLOGICAL COMMITTEE. EIGHTH ANNUAL REPORT.

1. During the year 1916 the Committee has made the following inspections:—

Within the Society's Local District.

- (a) February 12th, Allhallows Church, Barking-by-the-Tower.
- (b) April 15th, South Mimms Church, Middlesex.
- (c) October 7th, Waltham Abbey Church, Essex.

Outside the Local District.

- (d) July 15th, Battle Abbey, Sussex. The visit to Battle Abbey was the occasion of the annual week end inspection, and was fully up to the average in interest and enjoyment. The party stayed at the George Hotel, Battle, and consisted of seven members and one visitor, being joined by two more visitors for the inspection of the Abbey.

2. The following papers have been provided at the instance of the Committee and read at the meetings of the Society at Salisbury House, *viz.*:—

- (a) March 7th, "A visit to Tunis and Carthage," by Sir R. Armstrong-Jones, F.S.A.
- (b) November 7th, "English Mediaeval Monasteries," by R. Marshman Wattson.

3. The paper read before the Society on June 1st, 1915, by Miss F. Bagust, on "The Treatment of Nature in English Gothic Design," has been published in the volume of Transactions for that year.

4. The Committee is of opinion that the volumes of "Itineraries," published by the Ancient Monuments Commission, which include part or whole of the area embraced by the Society's Local District, should be procured and placed in the library. It is hoped that this may shortly be arranged.

5. Our member Dr. Wm. Simpson has recently joined the R.A.M.C., and the Committee will for a time be losing his active and valuable co-operation. The membership of the Committee remains unchanged, *viz.*, 9.

E. B. BISHOP, *Chairman.*

S. AUSTIN, *Hon. Sec.*

November 7th, 1916.

REPORT OF BOTANICAL COMMITTEE.

42, Avenue Road,
Highgate, N.,
December 3rd, 1916.

The Chairman of the Research Board,
London Natural History Society.

Dear Sir,

The work of the Botanical Committee during the year 1916 has been very limited so far as the Northern district has been concerned. Very little field work has been done, and the records of plants observed in the North which have reached the Secretary have been very few.

This is probably due to the pressure of work which has fallen on the shoulders of most of the members, and, further, to the fact that the work of these records is nearing its conclusion, and consequently the information as to the rarer plants needs closer application in the field than members can find time to give.

The Herbarium has continued to be used at the meetings, and in this respect the Hanbury-King Collection has been found to be of the greatest use, and it is hoped that in better times there will be considerable enlargement found to be possible in the local and in the main collection.

I remain,
Yours faithfully,
C. S. NICHOLSON.

SOUTHERN DISTRICT BOTANICAL COMMITTEE. REPORT FOR 1916.

The task of recording the Flora of the Southern District of our area progresses all too slowly. Correspondents and helpers are needed in all the sub-divisions, but especially in 2 (Wimbledon), 4 (Norwood), 6 (Caterham), and 9 (Kent Marshes).

114 additional species have been recorded during the year, the most noteworthy being as follows:—

<i>Ranunculus Lingua</i> , L.	<i>Mimulus Langsdorffii</i> , Donn.
<i>Alyssum incanum</i> , L.	<i>Lathraea Squamaria</i> , L.
<i>Saponaria Vaccaria</i> , L.	<i>Ajuga Chamaepitys</i> , Schreb.
<i>Stellaria palustris</i> , Retz.	<i>Viscum album</i> , L. (2 sub-divisions).
<i>Hypericum montanum</i> , L.	<i>Thesium humifusum</i> , DC.
<i>Trifolium subterraneum</i> , L.	<i>Spiranthes spiralis</i> , Koch.
<i>Potentilla argentea</i> , L.	<i>Aceras anthropophora</i> , Br.
<i>Hippuris vulgaris</i> , L.	<i>Iris foetidissima</i> , L.
<i>Galium tricornis</i> , Stokes.	<i>Danthonium Alisma</i> , Mill.
<i>Cnicus pratensis</i> , Willd.	<i>Scirpus triqueter</i> , L.
<i>Phyteuma orbiculare</i> , L.	<i>Carex elongata</i> , L.
<i>Campanula glomerata</i> , L.	„ <i>Pseudo-Cyperus</i> , L.
<i>Hottonia palustris</i> , L.	<i>Catabrosa aquatica</i> , Beauv.
<i>Anchusa sempervirens</i> , L.	

In addition, *Geranium pratense*, L., recorded in 1915 Report from a somewhat doubtful station, has this year been recorded in wild situations in two other sub-divisions.

It has been found advisable not to restrict records to the 1913 limit, mentioned in last year's Report.

Two formal meetings of the Committee have been held during the year.

Botanical records from the Southern District, *with full data and specimens* (fresh or dried), wherever possible, will be very welcome.

E. B. BISHOP, *Secretary and Recorder.*

November 13th, 1916.

LEPIDOPTERA COMMITTEE. REPORT FOR 1916.

1. The Committee has been still very handicapped in 1916 by war conditions. Following the loss of Mr. H. B. Williams, Mr. Worsley Wood has gone on active service, and other members have undertaken duties occupying part of their time. Hence it has been almost impossible to keep the work of the Committee on a normal basis.

2. A few records have been contributed during the year from various sources, but they have been very few owing to the matters mentioned above. Dr. E. A. Cockayne has now taken charge of the records, and all such should be sent to him direct.

3. Four meetings of the Committee and one excursion have been held during the year, but unfortunately the annual week-end fell through for the first time, as we were unable to obtain accommodation at the inn where it had been proposed to stay, and the party in any case could only have been got together with great difficulty.

4. The Committee has continued to do what it could to stimulate the Lepidoptera interest in the Society. A number of special exhibitions have been arranged, and also a few papers and discussions. For the most part these have been successful. The practice obtains now of circularising all Lepidopterists in the Society before items of this kind, and the results have generally been good.

LAWRENCE J. TREMAXNE, *Chairman and Secretary.*

November 9th, 1916.

ORNITHOLOGICAL RESEARCH COMMITTEE. ANNUAL REPORT FOR 1916.

Circumstances still compel the Committee to confine its attention to that part of the Society's district which lies north of the Thames. Four occurrences and one nesting species, new to this area, have been recorded during the year, bringing the totals up to 146 and 88 respectively.

New occurrences :—

Syrrhaptes paradoxus (Pallas' Sand Grouse). At noon on Monday, September 23rd, 1907, one seen flying over at Hendon

by Mr. W. Wells Bladen. See "British Birds," vol. 1, p. 190.
Haliaëtus albicilla (White-tailed Eagle). One seen over the Park, Weald Hall, Brentwood, on the 6th February, 1909. Recorded by Mr. Christopher J. H. Tower. See "British Birds," vol. 2, p. 388.

Pandion haliaëtus (Osprey). One appeared in the Park, Weald Hall, Brentwood, from 11th to 24th October, 1908. Recorded by Mr. Christopher J. H. Tower. See "British Birds," vol. 2, p. 388.

Stercorarius parasiticus (Richardson's Skua). Mr. E. D. Cumming writes ("Field," May 27th, 1916) that he saw an Arctic (*i.e.*, Richardson's) Skua pass over Hyde Park, low down, on May 16th, 1916. See "British Birds," vol. 10, p. 70.

The new nesting species is that of:—

Gallinago gallinago (Common Snipe). Nest found in Sewage Farm, Theydon Bois, early in May, 1916. Mr. F. J. Stubbs, who is responsible for the record, saw one of the eggs. Reported per W. E. G.

Other interesting records are:—

Caccabis rufa (Red-legged Partridge). Nest with five eggs, 16 feet up a tree, in a hollow, amongst ivy, near Theydon Bois, on May 18th, 1916. Reported by Mr. F. J. Stubbs per W. E. G.

Charadrius apricarius (Golden Plover). Fairly abundant in February, 1916, near Theydon Bois. Reported by Mr. F. J. Stubbs, per S. A.

Limnocyptes gallinula (Jack Snipe). One seen at Passingford Bridge, April 21st, 1916. Reported by Mr. F. J. Stubbs per S. A.

Two identified at Walthamstow Reservoirs, January 26th, 1916. Reported by Mr. S. Austin. One obtained Sewage Farm, Angel Road, Edmonton, February 12th, 1916. Reported by Mr. W. E. Glegg.

Numenius arquata (Curlew). A flock heard calling loudly, flying over Theydon Bois, July 20th, 1916. Reported by Mr. F. J. Stubbs per S. A.

Querquedula crecca (Common Teal). Over fifty observed, Walthamstow Reservoirs, December 27th, 1915. Reported by Mr. W. E. Glegg.

Mareca penelope (Widgeon). Female obtained, Sewage Farm, Angel Road, Edmonton, February 12th, 1916. Reported by Mr. W. E. Glegg.

Cinclus c. britannicus (British Dipper). On April 5th, 1916, I saw, in a partially flooded field near Hatfield, a Dipper apparently of the British form. W. Rowan. See "British Birds," vol. 10, p. 43.

Lanius excubitor (Great Grey Shrike). Mr. W. Howlett states ("Field," June 3rd, 1916, p. 881) that he saw one at Chingford on May 24th, 1916. See "British Birds," vol. 10, p. 46.

Micropus apus (Swift). Four observed flying over Staines

Reservoir on April 21st, 1916. This is six days earlier than any other of the Society's records. Reports from other observers indicate that this unusually early arrival was fairly general. Reported by Mr. W. E. Glegg.

The Committee has held during the year nine meetings, five of which were informal.

The "ringing" accomplished in connection with the "British Birds" marking scheme has dropped to the almost nominal number of 41.

One recovery is reported :—

Turdus merula (Blackbird), ringed at Nazeing, Essex, May 9th, 1915, recovered at Napton, near Rugby, December 23rd, 1915.

The Committee has provided four papers for the syllabus :— January 4th, "The London Gulls," by F. J. Stubbs; April 18th, "Uncommon British Birds," by P. J. Hanson; November 21st, "Aspects of Bird Life in Europe," by J. A. Simes; and January 28th, "Shore-breeding Birds," by P. J. Hanson and W. E. Glegg, at Woodford.

It has been decided to publish annually a report on the birds of Epping Forest in the form of a diary. This has been compiled during the present year and is published in these Transactions.

The photographic collection has been increased by the addition of several of Mr. P. J. Hanson's photographs.

The death of 2nd Lieut. F. Reynolds is a serious loss to the Society and particularly to the ornithologists with whom he was most closely associated. Lieut. Reynolds possessed a considerable amount of first-hand knowledge of bird-life, and was a very promising student. He was a clean-souled young Briton of the type that the country can ill-afford to spare, and the members of the Committee mourn the loss of an esteemed and respected friend and colleague.

For the Ornithological Committee,

WILLIAM E. GLEGG, *Secretary*.

November 3rd, 1916.

REPORT OF THE PLANT-GALL COMMITTEE FOR 1916.

The Plant-Gall Committee came into existence early in the year, and a list of additions to Mr. Swanton's catalogue for England was published in "The Entomologist" for January. These were chiefly from localities outside the Society's area, but the following records seem to come within the special district :—

Radicula amphibia, Druce, galled by *Dasynectura sisymbrii*, Schrank., Heathrow, Middlesex.

Vicia cracca, Linn., by *Perrisia viciae*, Kieff., near Betchworth, Surrey.

Epilobium angustifolium, Linn., by *Perrisia Kiefferiana*, Rübs., Tothill, Surrey.

Galium saxatile, Linn., by *Eriophyes galii*, Karp., near Betchworth, Surrey.

Leontodon hispidum, Linn., by *Tylenchus*, sp., near Betchworth Surrey.

Salix fragilis, Linn., by (i.) *Cryptocampus testaceipes*, Zadd., Barnes, Surrey. (ii.) *Eriophyes* (? *triradiatus*), abundant on the towpath between Kew Bridge and Putney, where it is spreadily rapidly. It also occurs on Barnes Common and at Earlsfield, Surrey; Chiswick Mall, Red Lion Square, Holborn, and Golder's Green (Dr. Cockayne), Middlesex; and round Woodford Green, Essex.

Salix caprea, Linn., by *Rhabdophaga nervorum*, Kieff., Esher, Surrey.

S. cinerea, Linn., by *Pontania pedunculi*, Hartig, Wimbledon, Surrey.

S. repens, Linn., by (i.) *Rhabdophaga rosariella*, Kieff., Esher, Surrey. (ii.) *R. salicis*, Schrank., Esher, Surrey.

Populus nigra, Linn., by *Pemphigus marsupialis*, Courchet, Chiswick, Middlesex, and Petersham, Surrey.

Malva moschata, Linn., by *Eriophyes gymnoproctus*, Nal., then recorded from Bucks, has since been found near Oxshott, Surrey. (Mrs. Tremayne.)

Pyrus torminalis, Ehrh., by *Eriophyes pyri*, Pagnst., Middlesex, and near Uxbridge and Fulmer, Bucks.

Lychnis dioica, Linn., by *Contarinia steini*, Karsch, near Fulmer, Bucks.

Lamium album, Linn., by *Macrolabis corrugans*, F. Löw., Chiswick, Middlesex.

H. J. BURKILL,
January, 1917.

CHINGFORD BRANCH. REPORT FOR 1916.

Notwithstanding the unfavourable conditions of 1916, the interest in the Chingford Branch has been more than maintained, and there has been a small accession of membership which will be still further increased next year.

There was, unfortunately, a sad loss in the death of Mr. S. G. Lewis, who was killed in action in France.

The largest attendance during the year was 37, the smallest muster was 14, the average total attendance being 22, or a better average than either 1915 or 1914.

The papers read and lectures delivered were as follows:—"A Visit to Tunis," by Sir R. Armstrong-Jones, M.D.; "The Life History of some Common Insects," by C. Nicholson, F.E.S.; "Liverworts," by J. Ross; "The Story of My Water Garden," by F. G. Gould; "Natural Features in English Place Names," by Rev. W. H. Dewhurst, M.A.; "A Garden that I Love," by E. Bernard Cook; "Lepidoptera Notes and Exhibits of a Collector," by R. T. Bowman; "Wind, Cloud and Sunshine," by C. H. Lees, D.Sc., F.R.S.

It is satisfactory to note that, with one exception, all these lectures were delivered by members of the Society, and still more satisfactory to record the fact that, without exception, they all attained a high standard and were greatly appreciated by the audience, as was shown by the keen discussions which took place after them.

The Chairman for the ensuing year is Rev. Canon Russell, M.A., and the Local Secretary, E. Samuelson, 39, The Ridgeway, Chingford.

PRESIDENTIAL ADDRESS.

(Read December 19th, 1916, by E. A. COCKAYNE, M.A., D.M., F.R.C.P., F.E.S.)

Through the eighteenth and the first half of the nineteenth centuries we frequently find nebulous outlines of the idea that animals and plants had reached their present stage of development by a long process of alteration from primitive and more closely related forms. These ideas of evolution took definite shape through the publication of Darwin's "Origin of Species," and were supported by such a vast array of facts that most thinking minds were soon persuaded of their fundamental truth. Darwin's theories of Natural Selection and of Sexual Selection, explanations of the way in which evolution had progressed, were also accepted at first by the majority of those who were able to believe in the central fact of evolution. But as time went on and facts unknown to Darwin were recorded and collated, it was recognised that his theories failed to cover the whole ground. De Vries, in his Mutation Theory, based largely on his experiments with *Enothera*, an evening primrose, called attention to the fact that besides the gradual almost imperceptible variations, on which Darwin relied, sudden big changes in living things took place, and might be hereditary.

Some scientists were so struck by this that they almost discarded the theories of Darwin, believing with de Vries that each organism passes through periods of instability, in which enormous evolutionary advances occur, followed by periods of comparative stability. This theory also made possible an agreement with the Geologists, who at that time were unwilling to allow sufficient age to the earth to admit of the very slow evolutionary changes of the Darwinians.

The rediscovery in 1900 of Gregor Mendel's account of his experiments, originally published in 1865, only a few years after the publication of the "Origin of Species," brought into great prominence the Mendelian theory of Heredity. This led to an enormous amount of exact work on problems of heredity in animals and plants, and, whatever may be the eventual fate of the theory itself, these cannot fail to be of immense value in the future.

Bateson may be taken as a prominent and complete exponent of this Mendelian theory, the essential basis of which is that each character, structural, chemical, or mental, in every animal and plant, is due to a definite factor, which is handed down as a whole from generation to generation.

This is obviously entirely opposed to the Law of Ancestral Heredity put forward by Galton, who thought that every individual possessed a united heritage, of which half was derived from each parent, quarter from each grandparent, and so on. There is a certain element of truth in Galton's law, but it in no way explains the differences in the various

children of the same parents, differences for which the Mendelian theory offers an adequate explanation.

To complete his theory of Heredity it became necessary for Darwin to offer some explanation of its mechanism. This he did in his theory of Pangenesis, in which he suggested that concrete bodies existed and acted as the carriers of structural and other peculiarities. He named the bodies gemmules, and they foreshadowed the factors of Mendel. The determinants of Weissmann's theory of later date still more closely corresponded to Mendel's factors.

Microscopical investigation by Cytologists has produced an imposing mass of evidence that the Mendelian factors, though not recognisable individually, can be seen in aggregate in each of the cells of the plant or animal body. They are in the form of small collections of a substance found only in the nucleus or central part of each cell and stain with dyes in a very characteristic way.

This substance is known as chromatin, and the minute aggregations of it are known as chromosomes. The number of chromosomes differs in different animals and plants, but is, with rare exceptions, constant for each species. Without entering into details it may be said that the behaviour of the chromosomes, both in the body cells and in the germ cells, is in accordance with the requirements of the Mendelian theory.

Reduction in the number of chromosomes always occurs during the development of the germ cells, both male and female, and this accounts for the fact, vital to the theory, that all the factors present in each body cell are not present in each germ cell. The germ cells only carry half the number present in the body cells. If in the body cells two factors for a given character are present, each germ cell will receive one of them, but if only one factor for the character is present, only half the germ cells will possess it and the others will not contain it.

An individual possessing a factor which another does not possess is a dominant in regard to that factor, the other without it being a recessive for that particular factor. And an individual possessing in its body cells two factors for a given character is said to be homozygous, because all its germ cells must alike contain that factor, though only single.

An individual having only one factor for a given character in its body cells is heterozygous; half its germ cells will possess it, half will be without it.

The outward appearance of the heterozygote may be intermediate between individuals possessing two factors and those with none, but more often it is indistinguishable from an individual with two factors, a homozygous dominant.

An organism cannot pass on to its offspring a factor which it did not itself receive in fertilisation, and parents, which are both destitute of a factor, can only produce offspring equally destitute of it.

Many apparent exceptions to the simple law were found, and a considerable number of them were discovered to be due to the existence of factors which caused no external difference in the appearance of the organism possessing them, but which prevented some other factor from

showing its presence in the usual way. These factors are known as inhibitory factors.

Another apparent exception to the sharp hard-and-fast demarcation between individuals possessing a factor and those without it, is afforded by the existence of animals with a perfect gradation of structure or colour pattern.

In more than one instance it has been proved that such gradations are due to the presence of a number of separate factors for closely similar structures or patterns. By long and laborious breeding experiments these factors could be isolated.

Many other apparent exceptions have been shown to be due to the complexities produced by the inter-action of one factor or another, and in so many cases have these exceptions been found ultimately to follow the Mendelian law in their heredity that some followers of Mendel believe that all characters are dependent on the presence or absence of these units, and that all evolutionary change has been brought about by them. Bateson believes that all evolution is due to the disappearance of factors one by one or in groups, allowing the remaining factors to show their presence unrestrained. The modern varieties of the sweet pea can be shown to have arisen in this way from one wild form. According to Bateson all the mutations met with in nature and in breeding experiments are due to the loss of one or more factors, and none has been proved to be due to the acquisition of new factors. In other words, all these new forms are Mendelian recessives to the old in respect of one or more factors. When it appears that a new dominant has arisen, an inhibitory factor has been lost.

Pursuing this idea to its logical conclusion, Bateson says that no acquired character can be inherited. Thus all factors must have been present in the ancestors of present forms of life, and their chromosome complexity must have been far greater. The further back upon the evolutionary trail one goes, the more factors must have been present. The ancestors of the mammals must have possessed the factors for leg structures as diverse as those of the tiger, the horse, the bat and the monkey. They must have possessed factors for pathological conditions met with in man, such structural peculiarities as brittleness of bones and polydactylism, and chemical peculiarities such as cystinuria and alkaptonuria.

It is even believed that the musical faculty is due to a Mendelian factor, and is usually prevented from showing itself by the presence of an inhibitory factor. It also must have been present in the lowly mammalian ancestor. Further down the original vertebrate must have had all these factors, and in addition all those for structures and chemical peculiarities found in birds, fish and reptiles. Finally all the factors for all characters of past and present animals and plants must have been present in the original lowly microscopic unicellular organism, the common ancestor of all terrestrial life.

This may be crudely stated, but it is the outline of the theory of evolution put forward by the whole-hearted Mendelian. It seems incredible. Evolution on this theory is a downward step. Lost factors can never be replaced, and it puts a very finite end to all

evolutionary progress, an end dependent on the number of factors which can still be lost and the rate at which their loss takes place.

It is difficult to see how factors can have existed from the beginning ready to meet conditions which were not even present on earth at the time. For instance, it is incredible that the factors for the wonderful chemical defences against bacteria and protozoa which animals possess could have existed before either host or parasite were evolved.

Mendelian dominants appear to arise *de novo* quite frequently in man. Many of these are, doubtless, to be explained by the fact that in heterozygotes the structural peculiarity may be so ill-developed as to pass unnoticed. Others may be due to loss of an inhibitory factor. Nevertheless it is remarkable how they tend to be perpetuated through a number of generations, though intermarriage with the general population takes place fortuitously, and one would expect most of the general population to possess the inhibitory factor.

If it can be proved that a Mendelian dominant really can appear *de novo*, then this theory must fall. It would mean that a character could be acquired and transmitted to subsequent generations. The possibility of the inheritance of acquired characters has been denied by many eminent biologists, but it appears to me that any theory of evolution except that of Bateson is dependent on it.

Actual proofs of the inheritance of acquired characters are probably impossible to bring forward. Experiments would have to extend over far too long a time. In spite of this some experiments have been conducted which in their results distinctly favour the possibility of its truth. Those of Kammerer on *Salamandra maculosa* and *Alytes obstetricans* may be cited. This toad normally lays eggs, with a large yolk and no gelatinous envelope, which stick to the legs of the male. The animal does not lay in the water and no large foot pads are developed. Kept in a hot atmosphere they took to the water, and in the course of several generations developed the secondary sexual character of the foot pad, laid eggs with small yolk, which was surrounded by a large amount of gelatinous material. Put under normal conditions the following generations continued to behave in this way, normal for most toads, but abnormal for this particular *Alytes*.

Bordage found that in Réunion peach trees in twenty years became evergreen, and their seeds planted in the mountains produced evergreen seedlings, though those from Europe planted in the same place produced deciduous seedlings.

Similar examples, chiefly in water plants and climbers, are collected in Henslow's "Inheritance of Acquired Characters in Plants." In all these experiments a return to the old environment for a few generations brings back the old characters. A long enough period would probably allow the new characters to remain as a constant feature. Nevertheless they do not afford a convincing proof of the theory. They may be compared to the condition so well known in butterflies under the name seasonal dimorphism. Here there is an alternation of generations very closely dependent on environmental conditions, and in each generation the facies of the butterfly is so different that the same butterfly has been described as two distinct species. The power

of showing two distinct colour or structural schemes under two different sets of conditions has been shown to obey the Mendelian law in certain cases and to be dependent on a single factor. That this can be the case is shown by Morgan's experiments on *Drosophila*. In one case supernumerary legs were produced, and in the cold gave a regular Mendelian result, but in a high temperature all, or nearly all, the flies were normal; in another case an abnormality of the abdomen appeared, which proved to be a sex-linked dominant, but was only present in flies reared in a moist atmosphere.

In this connection recent cytological work is of interest. It was advanced formerly, as a proof that acquired characters could not be transmitted, that the germ cells were permanent, unalterable and absolutely unrelated to the body cells; the latter were regarded as a mere temporary home for the germ plasm. Even while this was still believed some biologists thought that the fluids of the body might influence the germ plasm. Cameron and Gladstone in the "Journal of Anatomy and Physiology," 1916, have collected references to much work, which shows that the body cells are united to one another by delicate strands of protoplasm, and are not the separate units they were formerly thought to be. These authors have shown further that the body cells are united to the germ cells by similar strands of living matter. They point out how much more probable it is that the body-cells can react upon the germ cells if they are structurally united.

Bateson's theory, which starts with a very complex form of life, makes the first origin of life more difficult to imagine than any other. But once started it is easy to see that factors could be lost in mitosis, and since loss of factors, according to him, is the cause of evolution, it is easy to see how evolution took place. All the other theories depend on constant addition to the complexity of the germ cells, but they postulate the beginnings of life in some very lowly form originating from complex dead organic compounds, when the chemical activity of the earth and the physical conditions were widely different from those of to-day. Their weak point is that they offer no explanation of how increasing complexity can occur.

Darwin points out that evolution takes advantage of the slight instability of each living thing, but does not explain how this can occur. The Mendelians, who believe that new factors are added from time to time to the germ plasm, offer no explanation of the means by which they are added.

Semon in his "Mnemic Theory of Heredity," accepting the inheritance of acquired characters, believes that all stimuli acting simultaneously on an animal leave behind a coherent stimulation-complex, a sort of imprint on its body tissues and germ plasm alike. In later generations these imprints can be called forth by suitable stimuli.

Many imprints remain latent for generation after generation, the animals' environment not providing a suitable stimulus to make them show themselves in its outward form. Thus at the beginning of life every animal has a number of routes open to it, the particular route followed depending on the nature of the stimuli met with. According

to this author *Alytes* offers an example of an old memory being revived by conditions forcing the animal to take to an aquatic life, like the old aquatic life of the ancestral toad. The stimuli of these old surroundings had left a permanent imprint on the germ plasm, and the similar stimuli provided by Kammerer called it forth again.

Another theory has many points in common with Semon's. This takes the fact demonstrated by Darwin that in the individual increase or decrease of parts can be produced by increased or decreased use of them. It assumes that any such increase or decrease of a part of the body affects the germ plasm in such a way that it can be transmitted to the next generation. Cunningham, in his "Sexual Dimorphism in the Animal Kingdom," discusses it at considerable length. The known facts of biology point to its truth.

Atrophy of the eyes takes place in many unrelated cave-dwelling animals and in many deep-sea fishes, living at a depth where there is permanent darkness. The exceptions are those fish which carry luminous patches on them and so dimly light up their surroundings. These are provided with abnormally large eyes, like owls, lemurs of the genus *Loris*, and many other animals which feed in semi-darkness. Instances of this kind are probable enough, but it is much more difficult to accept the view that the elaborate horns of stags arose from the stimulus of their butting in the breeding season. Such a stimulus occurs for so very small a period in comparison with the whole duration of the life of the animal. Similar difficulty arises in regard to other marvellously elaborate secondary sexual characters, especially in the short-lived insects.

It seems to me that it is impossible to doubt that acquired characters are inherited, and that stimuli affecting the body do not also affect the germ plasm in some such way as Semon and Cunningham have suggested. It seems to me almost certain that mutations of a positive kind, Mendelian dominants due to acquired factors, are constantly occurring.

And any such acquisition of a useful character may readily and rapidly alter a whole species. In the rapid spread of melanism in some British lepidoptera, we probably have examples of this phenomenon, just as in the exclusively yellow race of *Callimorpha dominula*, found in Vallombrosa and parts of the Neapolitan area, we have an example of a lost factor, that for redness of the hindwings, altering the facies of all the members of a species in a definite area.

The great difficulty is to see how much importance to attach to these different methods of evolutionary progress. In this we might hope to derive some evidence from a study of Embryology and Palæontology. It has been shown that in the early stages of development of animals each individual recapitulates the whole history of the race. Man at the first stage is a unicellular organism like an amoeba, later he has gill slits like a fish, and so on. Unfortunately the recapitulation is too rapid and too imperfect to help us in seeing the single steps by which the advance took place.

Similarly, in the case of Palæontology we have only fossil bones and teeth left, and though in the case of some mammals a beautiful

series of skeletons has been discovered, giving us a general view of the course evolution has pursued, in no case is it sufficiently perfect to prove whether it was chiefly by almost imperceptible advances, or by a series of small sudden steps, or both.

What we require now is some master mind to amalgamate the Mendelian theory with the theories of heredity, which are the direct descendants of Darwin's Natural Selection, and to assign to each its true position in a comprehensive and unified theory of evolution.

THE LONDON GULLS.

(Abstract of Lecture delivered by F. J. STUBBS, on January 4th. 1916.)

It is, I think, no exaggeration to speak of the London gulls as one of the wonders of the bird world. For centuries mankind has viewed the seagull as the inhabitant of lonely coasts and wastes of sea, but to-day the creatures can hardly be observed under conditions more favourable than those presented by London Bridge or the Thames Embankment. These birds are true migrants, appearing in October and leaving London in early March; and during the summer months gulls are rarely seen along the river. They congregate chiefly between Putney and the Tower Bridge, and particularly along the Embankment. On January 11th, 1914, we estimated that not less than ten thousand gulls were visible between Westminster and Blackfriars; but no other census, before or since, has reached more than a fifth of this number. Indeed, between one and two thousand birds is the usual population on a favourable day along this stretch of the river; sometimes, however, we notice only a few hundreds.

The Thames is clearly the chief resort of the London gulls. A few miles north or south of the river gulls are no more frequent than in other inland counties, except when such valleys as that of the Roding are flooded. On these occasions there are almost always strong invasions of gulls, without doubt from the Thames valley.* The actual species is the blackheaded gull (*Larus ridibundus*)—rather an unhappy name for Londoners, as the bird is white-headed in its winter plumage. Ignorance of this change in colour has frequently led to the mistake of calling the bird the "common gull" or the "kittiwake"; and after all this is an excusable error in the townsman, for an ability to identify the various species of gulls is rarely met with except amongst professed ornithologists.

Yet other kinds do occur. The herring gull (*Larus argentatus*) is a regular visitor, not only to the river, but to certain of the parks. We

* During the prolonged frost of February, 1917, great flocks of gulls (chiefly *L. ridibundus*) frequented the Roding Valley, fifteen or twenty miles from London. They were reported at the same time from other counties besides Essex.

have seen scores of these gulls on the lake in St. James's Park, and they are frequently to be noticed about the docks. The common gull (*Larus canus*) is not quite so numerous, and appears to prefer the docks to the upper reaches of the river; in winter one may be sure of seeing this species sailing and mewing over the docks at Wapping. The lesser blackbacked gull (*Larus fuscus*) is comparatively rare, although we have occasionally noticed several individuals during the course of an Embankment walk. The greater blackbacked gull (*Larus marinus*), a familiar bird along the Thames below Purfleet, seldom strays up the river, and I have seen it on but a single occasion. It has never been my luck to observe the kittiwake (*Rissa tridactyla*) on the Thames in London, and I feel sure that it cannot be at all a frequent visitor. Charles Dixon has recorded it from his own observations for Waterloo and Westminster Bridges, but the majority of London "kittiwakes" have their origin in the readiness with which the inexperienced eye fails to distinguish between this species and the blackheaded gull in winter plumage. The conspicuous black terminal patch on the wing of the flying kittiwake is quite enough to separate the bird from the blackhead at any distance; and the dark eye and grey nape are sufficient, in winter, to identify the kittiwake when the common gull is in question. Gulls observed during late summer along the Thames by incautious observers may prove often to be terns, which are very gull-like in flight, colour, and habits. I have seen small parties near Greenwich, and heard of them higher up the river.

The blackheaded gull is in winter plumage when it reaches London in autumn, and the characteristic black mask does not appear until the following year, occasionally as early as January. Many individuals are in full summer livery in February, and by the end of March the few birds then loitering behind are invariably in breeding plumage. The nature of the change in the colour of the head, from white to black, seems still to require further elucidation. Probably it is due entirely to moult, and the growth of new feathers; but there are features which suggest colour change without moult, either by the shedding of the feather-tips, or by the "infusion of pigment." However caused, the change occupies but a few days.

The London gulls are a modern phenomenon. No doubt, in former years, odd birds appeared casually along the river, as they do in every inland county; but the hordes of to-day are a product of the last quarter of a century. Previous to 1895 little, if any, mention of the blackheaded gull is to be found in books or papers devoted to the ornithology of the Metropolitan district. To go back to J. E. Harting's "Birds of Middlesex" (1866), we do not find any record of the blackheaded gull as a London bird, and even at Kingsbury this observer can only refer to it as a chance visitor. Sir Digby Pigott, in his "London Birds" (1892), does not name the species, although referring to a flock of "kittiwakes" which remained about the Serpentine for some weeks of the winter of 1869. In H. K. Swann's "Birds of London" (1893) this gull is referred to as a visitor to the outer suburbs, especially towards the east, with the statement that "Blackheaded gulls have also visited the Serpentine in Hyde Park."

In the "Zoologist" for 1860 (p. 6922) and 1864 (p. 9049), Henry Hussey published elaborate lists of wildfowl that he had observed in the London parks from 1851 to 1864, but the blackheaded gull is not named. General ornithological works published prior to 1895 by such authorities as Newton, Sharpe, Saunders, Seebohm, etc., are silent on London gulls.

The origin of the invasion is difficult to settle. London naturalists lean towards the belief that the gulls first appeared in the early part of 1895. Certainly, in this year, they were deemed worthy of notice in the newspapers (*cf.* "The Times," November 6th, 1895; December 21st, 1898; November 25th, 1900; and many other records: some by reliable ornithologists like Irby, others by the "kittiwake" or the "common gull" sort); but, in his "Birds in London" (1898), W. H. Hudson points out that there was an invasion in force during the winter of 1887-8, and another in 1892-3. The following winter is not productive of records, and I think we have sufficient evidence to justify the acceptance of the winter 1894-5 as the beginning of the regular invasion such as we know it to-day. Since that season the birds have appeared annually without a break.

I am assured by men who are acquainted with the district that gulls have been known during the past fifty years as regular visitors in small numbers to the London Docks—an area rather out of the orbit of the London naturalist. Perhaps these were then, as they are to-day, common gulls or herring gulls; but now they are obscured by the swarming hordes of blackheads. A noticeable feature, common to all species, is the preponderance of mature birds in London. As a rule, amongst the blackheaded gulls the proportion of immature birds is seldom more than one per cent. These may, of course, be readily detected by the tail-bar; and the dowdy young of the common, lesser blackbacked, and herring gulls (the last two, by the way, not to be distinguished in flight) are equally conspicuous. As I say, I do not know the kittiwake on the Thames, although well acquainted with the species elsewhere; but I feel sure that the striking plumage of the immature kittiwake could hardly have escaped my eye had the species been present when I have been near the river.

The tameness of the "London gull" is noteworthy chiefly because this habit is not to be seen in all other countries. In parts of the coast round the Irish Sea (particularly the Isle of Man and Southport) the herring gull is the tame species, the blackhead not—thus reversing the psychology of the birds so far as London is concerned. At Southampton I have seen the kittiwake within inches of my hand, and on the North-east and the Scottish coast the same observation has been made on the common gull and the lesser blackback. For example, the common gull is the tame bird about some of the Scottish lochs, although I have not seen this confidence exhibited in England.

Blackheaded gulls in the vicinity of their great breeding places are far from tame—using the term apart from the remarkable boldness shown by a few individuals in each colony; and yet, at some of these stations, the London birds must be expected. This brings us to the question of the breeding haunts of the Thames colonies. It is a diffi-

cult problem, and we do not even know that the London birds do not migrate southwards, for during recent years breeding colonies have been established in many of the southern counties. The generally accepted opinion amongst naturalists is that the blackheaded gull has increased enormously during the past quarter of a century. This is still, however, not altogether free from conjecture, and the fact may be that the species is merely changing its geographical distribution. One must not forget that in former times this gull was extremely abundant as a breeding bird in many places where to-day it never nests—unless, indeed, the old haunts are again occupied during the course of the present increase.

Are the breeding colonies in Scotland and Ireland diminishing or increasing in any way? They seem to grow in England and Wales. During the past fifteen or twenty years, in my own experience, new colonies have been formed not only on Pennine moorlands far from the sea (S.E. Lancashire and S.W. Yorkshire) or on inland lakes (Cheshire and Anglesea), but on the coast. In Essex this gull was for centuries a numerous breeder, and then, thirty or forty years ago, became almost extinct as a summer bird; but at present the bird is decidedly increasing on several parts of the coast, and the same remark holds good for every maritime county. So many accounts of gulleries have been published that there is no need to add to their number; and, moreover, it is difficult adequately to describe the strange spectacle of the hordes of clamorous birds overhead, or the stranger aspect of the ground—paved with nests, and often, towards the end of the season, horrible with the carcasses of dead birds of all ages. The photographs now shown exhibit the chief types of gulleries, on maritime sand-dunes or marshes, on inland lakes, and on heather or cotton-grass moors; and they show also the simplicity of the nests and the various stages of the young and adult birds. The slides of the other species of British gulls illustrate a point I wish to emphasise—that in habits and distribution the blackheaded gull differs largely from its congeners, and should be viewed as an inland bird, quite at home on pastures, lakes, rivers, and (as we now know) in large towns.

What is the staple food of the London gull? Garbage floating down the river, I should fancy, for the amount provided in charity by the spectators along the Embankment is surely insufficient for the voracious mob clamouring along the parapets. If their food is garbage, what happens to this stuff during the summer months? This seems worth the attention of the sanitary student. The blackheaded gull is blessed with a real sea-side appetite, and shows no little address in its methods of obtaining food. I was once able to make a number of connected observations on the habits of the blackheaded gull in its campaign against an amphipod crustacean which inhabits burrows in the sand (*cf.* "Zoologist" for 1914, pp. 54-62). It will feed also on that extraordinarily agile creature the "sandhopper," and its most un-gull-like habit of hawking for high-flying insects after dark has often been noticed near the breeding grounds. That the bird will feed its young on trout I know from my own experiences, and in seaside villages it will rob poultry of their food. Against these depredations

can be placed the assiduous services rendered to the farmer as the gulls patrol both ploughed fields and pastures, so that, altogether, it can be reckoned a beneficial species. Its influence on sea fish, however, is unquestionably baneful.

We do not quite know where the London gulls spend the night. Although gulls are often active during the hours of darkness, their usual habit is to pass the night in sleep; and, as a rule, they frequent regular dormitories. The blackheaded gull in winter (during the past twenty years) has increased along the course of the Mersey and the Ship Canal between Liverpool and Manchester. These birds congregate each night on certain of the meres of northern Cheshire, and some at least of the London gulls sleep on the larger reservoirs of the metropolitan area. Yet it has seemed to me that many pass the night on the river itself, roosting on quiet barges; but this is a detail on which more observations are needed.

The Thames gulls are now so well established that they are seen only by the visitor to London; and in truth they form a wonderful spectacle. A great line of sea cliffs swarming with snowy kittiwakes, or gannets, or gulls, or guillemots, is a memorable spectacle; but I doubt whether in the whole range of nature there is anything so incongruously beautiful as that provided any bright winter morning by a whirling clamour of blackheaded gulls seen against a background of Thames-side architecture. Billingsgate and the solemn mass of St. Paul's viewed through a haze of gulls: what finer subject for the painter? Yet no artist has accomplished it, although the scene is well worth recording. No one can say how long these birds will continue to grace the river; any year may be their last. Even an ancient nesting haunt, with centuries of domestic associations, may be deserted in what looks like mere caprice; and the blackheaded gull may (and probably will) vanish from London as unaccountably as it came.

SOME POINTS OF INTEREST IN THE GEOMETRIDÆ.

(Read May 2nd, 1916. Written by L. B. PROUT, F.E.S.)

The title chosen for my paper this evening was designed to give me the widest possible scope, as I had not decided, at the time of promising it, which particular points I should find myself best prepared to discuss on the occasion. I may say, however, that my general intention was fairly definite, namely, to try to arrange to attend the meeting, provide an extensive exhibit of some of the more striking moths of the family and "talk round" these, thereby obviating the necessity for the preparation of a set paper, and at the same time perhaps interesting some of our members who have no desire for a specific acquaintance with the Geometridæ in particular, or who have so little knowledge of the Lepidoptera that they may excusably find it difficult and tedious to

follow details unaccompanied by illustrations. This "general intention" has unfortunately been frustrated by the force of circumstances. Necessary absence from London will again rob me of the pleasure of meeting my friends of the London Natural History Society, a written paper becomes essential to the redemption of my promise, and this so far encroaches on my very scanty leisure as to put out of the question the gathering together of the proposed exhibit—even if the difficulties of its "transport" in my absence could have been successfully surmounted. I must therefore ask the kind indulgence of my fellow-members for a very poor performance and for the risk of boring very considerably at least a section of the audience.

For there is no such thing as *universal* "interest." Even *general* interest is confined to a comparatively narrow range of subjects, of which it must regretfully be admitted Natural History is not one. When we come to the smaller Cosmos of the Natural History Society, this latter assertion does not hold, to be sure; but to take a general interest in natural history is one thing, to take a special interest in entomology quite another—to say nothing of the Lepidoptera or the Geometridæ in particular. There is still room for wide divergences of taste, and I am only too well aware that many points which may be of absorbing interest to the specialist—questions of classification, differentiation of closely allied species, variability, geographical range, etc.—may often make little appeal (if any) to the wider circle. I hope, however, I may escape the danger of considering that the title of my paper justifies my reading into it the words "to me"—"Some Points of Interest *to me* in the Geometridæ"—and avoid concentrating attention on these specialists' questions.

The family of moths to which for a good many years I have given my almost exclusive study—the Geometridæ—is in most respects an exceedingly natural one, and has been so regarded at least since the time of Linnaeus. Of course mistakes have at times been made, especially by incompetent or careless workers, in assigning to the family this or that species or genus which really belongs elsewhere, but this does not invalidate the general statement. It is partly due to the fact that the most obviously patent distinction is found in the larval or caterpillar stage, while museum entomologists must perforce work largely with the perfect insect, the biology of such an overwhelming proportion of the exotic species being still unknown. There are, however, as I shall point out presently, good imaginal characters also, and I am ready to persist in the charge of carelessness or incompetence against the systematists who fail to assign a Geometrid moth to its correct family in any but an almost infinitesimal percentage of cases—presumably quite archaic or generalised forms. The disposal of the family into subfamilies is sometimes a less simple matter, and the last word has not yet been said upon it by a very long way; but this is one of those specialistic questions which I have promised to avoid this evening. A parenthesis may, however, be allowed, as it has a certain applicability to a section of my audience. A few of the oldest members of the "North London" element of our present Society may possibly remember that in February, 1895, I read a paper on

"Specialists and Specialism," of which an abstract is published in *The Entomologist's Record*, vol. vi., pp. 124-5, and after advocating the importance of specialism announced my intention of devoting myself to four Larentiid genera. It soon became evident that these "genera," as then accepted, were far from natural ones, and it was absolutely essential to study their interlacings and affinities outside. This led to the adoption of the subfamily *Larentiinae* as a whole, and this again to that of the entire family Geometridæ. I have now a much wider field of work than I can ever hope to cover worthily, but at least I have the satisfaction of knowing pretty definitely the limits of my domain, and can proceed accordingly.

The larval character, which has given the name of Geometridæ or "ground-measurers" to the family, is probably well known to most naturalists. It consists in the loss of some (with rare exceptions all the three anterior pairs) of the abdominal legs or prolegs and the resultant substitution, for the "wriggling" modes of progression of most caterpillars, of a very characteristic "looping" gait, the legless part of the body being drawn up into a loop as soon as the posterior legs or claspers lose their foothold, these claspers being then brought forward and planted close to the thoracic legs, the body next extended to full length, and so on by alternate loopings and straightenings, suggesting a process of measuring out the surface passed over. In this way considerable rapidity of progression is obtained, and it is an interesting subject for enquiry whether this be the primary purpose of the loss of some of the prolegs. Every observer of caterpillars knows that even in their most active days (as a rule shortly after hatching from the egg) the "loopers" have no monopoly of speed. The "woolly bears," or larvæ of the Arctiids, can get along with amazing rapidity, and one would like to try experiments, if sufficiently tractable subjects could be obtained, in racing matches between larvæ of various species, genera and families. But it by no means follows that because other caterpillars also require powers of rapid motion for their safety and have acquired them in other ways, therefore those other ways would have been the most suitable to the needs of the Geometridæ. The said "woolly bears" feed chiefly on low plants, have but small prehensile capacity, and exercise their powers of locomotion chiefly on the ground. The larger Geometridæ, on the other hand, feed for the most part on trees or shrubs, and must needs be able to cling firmly in order to escape too frequent interference from the wind or other shakings of their resting-place, and, moreover, will find it an obvious advantage to be able to pass rapidly from one leaf to another, or from one twig to another, in a way that would be impracticable to the fully-legged, weakly-clasping larva. To this theory of adaptability to arboreal locomotion, it may very justly be objected that plenty of non-Geometrid larvæ also feed on trees. Most of the Hawk-Moths and Notodonts occur at once to the Lepidopterist, besides a sprinkling of Noctuids, a few butterflies and many Tortrices and other "small fry," not to mention the Saw-flies. I do not feel competent to give an absolutely full answer to such an objection, and even if I did it would take me away from my subject of the Geometridæ; but I may just point out

that it is one thing to recognise that a certain type of structure is an advantage to larvæ of certain habits, and quite another to belittle the resources of Nature by assuming that she has only *one* means of dealing with tree-feeding larvæ. For the small Tortrix larvæ, for instance, protection is afforded by the rolling-up of a leaf as a domicile, and a single leaf will afford food for a long time, so that changes of abode, with their consequent risks, are quite few and far between. Many large tree-feeding larvæ, again, like the "Puss," some Hawk-Moths, etc., have protective or "warning" attitudes or secrete poisons, or in some other way maintain the "struggle for existence" under favourable conditions with a minimum of movement.

Although I believe there is no exception whatever to the statement that a larva which has lost the first three pairs of prolegs is a "Geometer," and although it is probably true that something like 90 per cent. of the Geometers have lost all these, and more than 90 per cent. of the remainder show at least considerable losses or abortions in this direction, yet even this is not quite an *absolute* character of the Geometridæ. The attractive "Orange Underwings" of our spring sunshine (the genus *Brephos*) are certainly Geometrid, though most systematists have been deceived by their larvæ; these have the full complement of prolegs, merely with the anterior pairs a little weakened and their half-looping gait would not distinguish them from some Noctuids. An Australian genus—*Mnesampela*—is even said to have fully legged larvæ, quite as the Noctuids. Except for *Brephos*, our British Geometridæ occasion no difficulty, for no one would take account of the vestiges of additional legs in *Himera pennaria*, *Gonodontis bidentata*, *Alsophila aescularia*, or the common "Brimstone Moth," as affording them any claim to be removed from the family.

The added strength of the anal claspers of most Geometrid larvæ, which is perhaps correlated with the loss of most of the others, brings about another "point of interest" in the family—the marvellous power of protective resemblance to twigs. This is so generally known that I need not enlarge upon it, but the tremendous grip obtained at the anal end, the great elongation of the legless segments, and their rigidity—conditions which would seem incompatible with the powers of separate movement of every segment which are necessary to the mode of progression of, say, a Noctuid larva—these are factors of great importance. I need scarcely remind any observer how the body, coloured to match its surroundings, is held absolutely motionless, outstretched at a suitable angle, with the head and thoracic legs tucked closely together so as not to destroy the illusion, which is often still further enhanced by the presence of knobs, or protuberances, on the larva.

The late Mr. Tutt seems to have considered the loss of prolegs, which we have been considering, of no primary phylogenetic importance. This may be so, but I think it is no very recent adaptation and must be older than the present *internal* feeding of some of the Geometrid larvæ, such as the burrowing into fir cones in the case of that of *Eupithecia pini*, Retz. (= *togata*, Hb.), or the cramped life of that of some *Perizoma* (= *Emmelesia*) within the seed capsules of *Lychnis*. These larvæ get scarcely any opportunity of exercising freely the

"looping" method of locomotion, and it is hard to conceive how they could have acquired it except by inheritance from exposed larvæ, to which it was some advantage.

Turning to the imago, or perfect insect, it is easy to find characters which prove definitely that a given specimen is *not* Geometrid, or to find characters in *some* Geometrid species which prove their position, but I do not think it is so generally known that there is at any rate *one* character which (so far as at present investigated) will separate *every* Geometrid from every non-Geometrid. In the first category (impossible Geometrid characters) one could place, for instance, the long upcurved palpi, such as one finds in many Noctuid or "Deltoid" moths, or a good many phases of neururation of the wings, which are too intricate to be discussed on this occasion. Of characters only found in Geometridæ, again, there are certain types of neururation, or the presence in the forewing of the structure which Meyrick named the "fovea"—a scaleless depression on the underside near the base, of which the function seems to be still unknown, though it is in nearly all cases a secondary sexual character, confined to the male. But the fovea is only characteristic of a single subfamily, and not by a long way universal even in that: while as to the neururation, I need only remind you that one of the chief things which brought severe condemnation upon Meyrick's in most respects really excellent work, was his outrageous mistake of uniting the Geometridæ with the Notodonts and some others because of a great similarity in neururation. The character which has proved absolute was not even noticed by Meyrick, nor by most other systematists, until Dr. Jordan pointed out its value. It consists in the cavity beneath the base of the abdomen, sometimes spoken of as the tympanum, though the belief that its chief function was auditory has been called in question. In the Geometridæ, this cavity is large and quite distinctively formed, extending beneath the pleura of the *second* abdominal segment, that of the first segment being much reduced. Only in the Pyralidæ is any similarity to this structure seen, and even there it is not identical; and they differ from the Geometridæ in so many other essential characters—*e.g.*, the presence of an additional vein in the hindwing—that no confusion is possible.

The structure of the antennæ, apart from the fact that it generally differs in the two sexes, shows perhaps a wider range of variability than in any other family. Not having pursued any extensive studies on the organ outside the Geometridæ, I would not venture to make this assertion on my own authority, but I gather from a general paper by Bodine, on "The Antennæ of Lepidoptera" ("Trans. Amer. Ent. Soc.," vol. 23), that such is the case, and I can certainly vouch for it that almost every conceivable modification occurs among my favourites, from absolutely simple to very highly pectinate or plumose, or furnished with ciliation of every degree or kind, or even in a few genera (chiefly the South American *Rhopalodes*), a definite attempt to copy the clubbed form of the butterflies. Into the details of the various types of sensory hairs found on them, the curious pilose clothing of the antennæ of the genus *Macrotis* and other specialisations, I do not propose to enter; but the evident value of the highly pectinate antennæ to the males,

which have to search out their females under exceptionally difficult conditions—notably when the female is wingless—arrested attention long ago, and may be appropriately mentioned now, because one of the points which I wish particularly to discuss is this apterous condition of several Geometrid females. We know too little about the habits of the species in which the female antennæ are heavily pectinate to be able to offer any explanation of their purpose, unless it be connected with the discovery of the right food-plant for oviposition, which is of course the chief business of the sex. The phenomenon is the most noticeable in the African Geometridæ, and one cannot help feeling that at any rate it is associated with some rather exceptional activity of the female. In a few of the species in question the male is still unknown, while in quite a number the females are more frequently taken than the males—all the more remarkable when one considers how general is the reverse condition in collections obtained from abroad. I may give an illustration from material furnished by my good friend Mr. F. W. Short, B.A., of Selukwe, S. Rhodesia, to whom I was kindly introduced by our valued member Mr. Braithwaite. Of Mr. Short's most conspicuous discovery, *Omphax shorti*, Prout, with simple antenna, I have thus far received six males but no female. Of an allied species belonging to the genus or subgenus *Heterorachis* (which I have only been able to differentiate definitely from *Omphax* by the pectinate antenna of both sexes) he has sent me seven females and only a single male! No instance is known in which the antenna of the female is pectinate and that of the male non-pectinate; indeed very rarely do the female pectinations even equal those of the male in length; but I believe I have lighted quite recently on a species of South American "Emerald" (genus *Phrudocentra*, new species) in which they are decidedly longer in the ♀. Confirmatory evidence is desirable, as the phenomenon would be unique, not only in the Geometridæ, but in the Lepidoptera, and at present only one example of each sex is known, so that it is not inconceivable, however unlikely, that they represent two separate species, exceedingly closely allied, occurring in the same locality and of which the alternative sexes remain unknown. One wonders whether in a few of these extreme cases the male is of an abnormally retiring disposition and the female has had to acquire the leap-year habit!

No Lepidoptera—and therefore, of course, no Geometridæ—are without wings in the male sex, but the phenomenon of winglessness turns up here and there in the female, in various quite unrelated groups, proving that it has been independently acquired, though presumably to meet some common need. As the majority of the Geometridæ in which this occurs—and all the British cases in the family—belong to the species which reach the perfect state in the winter months or very early spring, a pretty obvious deduction has been drawn that there is some definite connection between the apterous condition and winter emergence. Much speculative writing has appeared on the subject, and I must plead guilty to having perpetrated a certain amount myself in the remote past; but it has been reserved to Dr. Chapman to bring out the explanation which correlates all the

known cases of winglessness, and in favour of his theory I have readily abandoned the cruder and less satisfying views of the dangers of exposure of a wing-surface to rough weather, restrictions of suitable hiding-places on the trees in their leafless condition, etc. Dr. Chapman's solution of the problem is concisely set forth in the *Entomologist's Record*, vol. xv., pp. 43-46, and should be studied by all who are interested in the subject.

The New Zealand entomologist, Prof. G. V. Hudson, unacquainted with Dr. Chapman's paper, later (*Ent. Mo. Mag.*, xlviii., 269) suggested a different and less satisfying explanation of the winglessness of winter females, though also connected with the necessity of keeping them in contact with the food-plant. His idea was that the state of semi-torpor, induced by the cold weather, might prevent them from finding their way back thereto, while not being sufficiently complete to interfere with the vital function of oviposition. The objections to this view seem to me to be: that even semi-torpid females do *not* lay normally, nor even pair—or at least this has been my experience; that the male, equally affected, would presumably be unable to find the female, so that this theory should demand winglessness of *both* sexes; and last, but not least, that if the average weather conditions of the time of year were adverse to the exercise of the life functions of the species, it is natural to conclude that they would be adverse likewise to its emergence from the pupa at that particular time of year at all.

A very wide and interesting field of investigation is opened up by the numerous and varied "secondary sexual" structures in the males of the Geometridæ, particularly on the legs or wings. Except for the general idea that they are mainly scent-organs for the attraction of the other sex, we as yet know next to nothing about them physiologically, and little enough morphologically. I shall welcome the collaboration of any specialist on this branch of enquiry who would tackle it from the point of view of the Geometridæ in particular. The species of which I have bred and paired more examples than any other—*Ptychopoda virgularia*, Hb., more correctly called *seriata*, Schrank—belongs to a genus in which the male hind leg is subject to numerous abortions, sometimes accompanied by the development of remarkable tufts or tassels of hair. Yet I have been unable hitherto to discover any peculiarity in the habits of courtship or the pairing posture to explain these modifications. As the hind leg in the species in question has certainly lost its original function, it is self-evident that some modified or substituted function exists. In some of the subgenera of *Ptychopoda* the hair-tufts are found instead (or in addition) at the abdominal margin of the hindwing, which is then more or less aborted or altered in shape to accommodate these modifications. Some genera have tufts of hair placed on different parts of the underside of the hindwing, the different species of a genus being usually distinguished by the different position or distribution of these, while there may also exist side-by-side with them (as in the genera *Achlora*, *Noreia*, etc.) close congeners with the wings quite simple. Sometimes, again, the tufts are transferred to one or two of the abdominal somites. In two

or three of the sub-families, particularly in the "Boarmiids" and "Emeralds," it is a very common occurrence for the male hindleg to be more or less strongly dilated and furnished with a groove, in which lies folded a long pencil of hair, capable of being expanded by rubbing the leg against a spine, which in these cases is always developed over the orifice of the abdominal basal cavity. To the systematist, who has often to deal with specimens from which the hindlegs have been broken off, the presence of this spine is a boon as an index to the leg-structure; though I cannot at all agree with the American specialists, Hulst and Pearsall, that the said hair-pencil is a character of generic value.

A remarkable genus from this point of view is *Anisodes*, Guen., a close relative of our *Cosymbia* (= *Zonosoma*), of very general distribution outside the palaearctic region. The female scarcely differs from *Cosymbia*, except in the longer palpi, and has invariably four well-developed spurs on the hindleg. The male shows all kinds of modifications, on which various genera (according to Hampson, subgenera) have been founded; its hind tibia may be spurless, or may have 1, 2, 3 or perhaps even 4 spurs, it may be long and simple or much shortened and with more or less long tufts of hair, the hind-femur or the midtibia may be tufted, or the modifications may even be transferred to the foreleg, or to the palpus, or occasionally the costal margin of the forewing may be folded.

In the sub-family Larentiinae (my old friends the "Carpet" moths and allies) the hindleg is very rarely modified, the secondary sexual characters being usually borne by the wing. Some of you will be familiar with the hair-pencils on the underside of *Lygria* (*prunata*, *populata*, etc.) and of *Eustroma* (*reticulata*, etc.); the apparatus in the latter was carefully described by Dr. Chapman in *The Entomologist's Record*, vol. v., pp. 5-6. Similar tufts turn up occasionally in extra-European species. Then there are abortions of the inner-marginal part of the hindwing in the males of the *Chesias* group, this part of the wing being here formed into a kind of pocket opening to the underside. Still more remarkable are the modifications in the *Lobophora* group. Our British representatives give no idea of the extent of these, though the lappets, suggesting additional wings, are curious enough in *L. halterata* and won for it, from our old entomologists, the popular name of the "Seraphim." In the Indo-Australian *Sauris* the hindwing is sometimes, in addition, enormously reduced, the neurulation distorted, the distal margin sometimes missbapen and bearing additional scent-patches. Similar remarks apply to *Tatosoma*, from New Zealand, which has, further, a most abnormally elongate male abdomen. In *Toxopantes botulata*, Feld., the hindwing is absurdly small in comparison with the forewing, mostly occupied with these sexual tufts and distortions, and has a long pointed tail near the apex.

As the points discussed or mentioned in this paper are only a few, selected almost at random from the many which might have deserved attention, I think I shall at least have shown something of the wide-ness of the range of interest open to the student of the Geometridae, and the urgent need for a larger band of workers.

APTEROUSNESS IN LEPIDOPTERA.

(By T. A. CHAPMAN, M.D., F.Z.S., F.E.S. To introduce a discussion, time permitting, however, only portions to be read, October 18th, 1916.)

When the President asked me to make some remarks by way of opening a discussion on "Winglessness in Lepidoptera," I thought it was an honour that I could not well decline. I owe it, probably, to having contributed a short note on "Winglessness in Winter Moths" to the *Entomologist's Record*, so long ago as 1908.* In that note I took several things for granted that perhaps it would be well to mention more distinctly.

One may begin by remembering that wings are a characteristic of insects of all orders, if we except the Aptera (*Collembola*, *Thysanura*), which are not really an order of insects of only the same rank as Coleoptera and Lepidoptera, but correspond rather to the whole of the rest of the Insecta, than to being merely an order like any one of the others.

It is, then, necessary to admit that any insects (except Aptera) without wings are descended from winged ancestors.

The orders or sub-orders, that are throughout wingless, are the fleas, that are Aberrant Diptera, and are often included in that order, and in any case are supposed to have a common ancestry with Diptera, and the Mallophaga, which are similarly situated with reference to the Neuroptera and the Anoplura (lice) probably similarly derivatives of Hemiptera.

In considering what explanation we can give why certain Lepidoptera are wingless, we ought to have some assistance if we can learn anything as to the cause of winglessness in other orders.

About the other orders, I unfortunately possess very little detailed knowledge, and it would not be admissable, even if I had, to enter on much discussion about them. Still we may find that some facts and explanations arising out of them are sufficiently within our reach to be available and useful.

There are three sub-orders of true insects that are entirely wingless, the *Siphonoptera* (fleas), the *Mallophaga* (bird-lice), the *Anoplura* (lice), and to these we may add one species, *Cimex lectularius*, since it agrees with these sub-orders in the main character which they have in common and is also wingless. These four groups are in no wise related to each other, but they are all parasitic and are all wingless. It seems so evident that it is hardly worth noting, that as other wingless insects do not become parasitic, and since their ancestors had wings, that the parasitism came first, and the winglessness as a consequence followed.

I think we may first notice that the winglessness is so absolute

* Vol. 15, p. 43.

throughout each of the sub-orders that the forces commanding must have been strong and may have been more than one. Perhaps the most imperative was the necessity of making their way easily amongst feathers or furs.

Wings would also probably make their existence difficult, or even impossible, by affording their hosts the means of capturing and ejecting them. A third, and I think hardly less effective, reason against their having wings is that, that seems to be much the most general cause of winglessness in insects, *viz.*, the necessity that they should not run any risks of being separated from their very limited and localised habitats. In the Mallophaga, we may say broadly that each species is attached to one species of bird, and it would be useless for it to reach another species (supposing it could fly), and as a matter of fact they are handed down as heirlooms from parents to their nestlings.

The fleas at first sight seem not quite in line with this, since they live on their hosts only in their imaginal state. It is nevertheless the case that the larvæ depend for their food on their hosts, living on the various dejecta they leave in their nests, and thrive especially on their blood voided, little changed, by their parents. There are exceptional species and genera, but the greater number of species affect small mammals and birds, in both cases finding food for the larvæ in the nests and their vicinity.

This partial temporary separation from their hosts is probably co-related with the fact that many fleas are less strict than the Mallophaga in sticking to one host, and as a result, in various rodents harbouring several species of fleas, and various fleas affecting several rodents. In view of the food of the larvæ of the flea, and the places where it may be found, it is obvious that the newly emerged fleas are almost certain to find a proper host. It is not necessary to assume that *Cimex lectularius* acquired its flattened form by hiding in the chinks of bedsteads, its evolution began, no doubt, before that of bedsteads, but did probably arise from the value of living in cracks in the wood of huts and various fittings and implements of human dwellings, and along with it, winglessness to prevent the chance of hopeless wandering from the haunts of its victims no doubt arose.

In these, and of course in not a few other cases, the cause of winglessness was to avoid the dangers of travelling abroad. We must accept, I think, also the simple idea that in many cases travelling was simply useless and unnecessary, and the wings disappeared under the law that superfluous organs dwindle and disappear, without their being in any way dangerous, except in the very general sense of absorbing matter and energy that might be more usefully applied. Under this heading would perhaps fall many of the cases amongst the Orthoptera, in which I think no family is without apterous representatives, but I know too little of the habits of these to be entitled to form any definite opinion.

Beetles that are apterous in both sexes are numerous, especially in the *Carabidae*, in which uselessness rather than dangers of flight is probably the efficient selective force. It has been noted that beetles of families usually alate are wingless in oceanic islands, and that the

probable cause is here the danger of being driven out to sea and lost in storms.

There are a few Diptera and Neuroptera that are wingless in both sexes, as well as some parasitic Hymenoptera. The winglessness of the workers of ants and termites is a very large subject, difficult to summarise briefly, but dispersion for the spread of the species and for cross fertilisation is provided for by the ♂s and ♀s being winged, the workers having merely localised duties obviously do not need them.

I believe there are no apterous forms amongst bees, wasps, or dragonflies, nor in Lepidoptera are any species apterous in both sexes.

When we come to cases of one sex only being apterous we find that the apterousness of the ♀ is very common, of the ♂ very rare. Some Perlidae have males with reduced wings, these probably wait on stones, etc., in streams, for the emerging females. That the same object affects *Anthophorobia* is probable, but not at all certain.

Then there is a genus of beetles, which completes the list of species I know of with the ♂ only wingless. I may refer to this more fully, as I have myself observed these insects.

Mr. Champion tells me that *Xyleborus dispar* belongs to the only genus of beetles he knows of that has a wingless male, although the female is winged. The object of this most unusual arrangement is very evident. We were not the discoverers of the curious habit which is correlated with the apterousness of the male beetle, but I think the only first hand account of it in any English work, is that I gave in the *Transactions of the Entomological Society* for 1904, p. 100. The female beetle bores into the solid wood of dying and dead beech trees, that have not been dead too long to have sap and the fungus growth depending on the dead sap, on which the larvæ in the solid wood feed. When the imagines reach maturity they emerge through the bark on to the surface of the trunk or stump. The males being wingless get no further, and may be found, several together, where a female is about to emerge, struggling to secure her as a mate. The fertilised females being winged, depart to search for timber suitable for them to form their burrows in, that from which they have emerged being always, or nearly always, now too old to be available. If the males were winged, there would be, for every female ready to lay eggs, two searches, one by the male and another by the female, for the suitable new habitat and as such places are often very scarce, though occasionally no doubt abundant, there would be a double danger of failure to find it. The male being wingless secures that every female as it emerges shall be fertilised, and shall be qualified, without further delay, to make her burrow for oviposition.

It might be suggested that this habit excludes cross-fertilisation, which is of such value, but this is not so; it may sometimes happen, especially, no doubt, when stumps, either after felling trees or by their being taken down by storms, are plentiful, that only one female makes a burrow in a tree, but this is certainly a very rare event, and usually something like a dozen, say three or four to a score, burrows of oviposition occur in a colonised stump, so that the emerging beetles are largely unrelated.

It may be asked if this method of securing a not unusual object is

so useful and effective why is it so rare? To this the answer is that the actual conditions involved are not perhaps very frequent, though the object to be attained is. We must also remember, as we are very apt to forget, in considering such questions, that in different instances that appear to us, and possibly are, almost identical in their conditions and objects, and in which we might suppose one best way would have been adopted, Nature does not agree, but reaches the end in view in ways that may be different in each case from that adopted in any of the others. We are apt to forget how resourceful she is, that these different methods are possibly of value in preventing enemies from taking a wide and easy grasp of the habits of their victims, but more especially because the difficulty to be overcome has been approached along a different line of evolution by the organism that has to solve it, and that similar solutions by unrelated organisms, though not uncommon, are rare to a degree parallel to that of organisms that have become exceedingly alike by way of convergence instead of from common descent.

There are some ants recorded to have wingless males, and amongst the Chalcids there is the remarkable case of *Anthophorabia retusa*, described by Newport in the *Linnean Transactions*, vol. xxi., p. 65. The female is winged and the male brachypterous. I may quote, "both sexes are found moving about freely in the cell" (of the devoured *Anthophora*), "the male is by far the least active, and especially from the fact that his organs of vision are single ocelli, instead of large compound eyes, as in the other sex, I am led to the conclusion that impregnation is effected before the insects quit their habitation; the wings are small, narrow, and extend backwards when folded, as they usually are, to about one half the length of the abdomen, I have never seen the male unfold, or attempt to use them." They are in fact too small to be useful, the male has the usual three ocelli, but a single ocellus in place of each compound eye, almost a larval character, and an indication of imperfect development. Newport's narrative suggests that he supposed pairing to take place in the cell, and this may be so, but it is quite possible that the parasites in neighbouring cells, and probably of different parentage, are able to mix before pairing takes place, and so crossing is secured, this is apparently very possible even if it is unusual. The cells must be opened for the females to escape, so that the only difficulty would arise when only one cell in a burrow was parasitised.

Of species that have the females only without wings, there are not a few beetles, the *Coccidae* are largely in this case, there is at least one *Trichopteron*. Most of these instances seem to be due to the desirability of the ♀s not going far from the suitable habitats. The *Coccidae* adhere to the food plant, the glow-worm, as an example of Coleoptera, has often very restricted areas within which its prey is sure to be found. Crossing is assured by the males being winged. The dispersion of the species is secured by the larvæ, in *Coccidae* these are very abundant, and though too small to travel long distances by their own exertions, can easily be carried by birds, insects, wind, etc., and are so numerous that vast losses amongst them are unimportant, compared say with proportionally similar losses amongst the adult ♀s. In the

case of the glow-worm, we know that the larva does a deal of travelling, thus securing dispersion, and here again the loss of a larva (by quitting one suitable area and failing to find another) is trifling compared to that of a fertile female.

In the Lepidoptera are a considerable number of instances of species whose females are wingless, but no instance has been observed of a wingless male Lepidopteron. The object to be attained seems, almost obviously, to be that the eggs shall be laid at a place where the adult larva found suitable conditions, or as near to it as the discovery of a satisfactory puparium permitted. It seems necessary to assume that the dispersion of the species is adequately provided for by the journeys that may be taken by the larvæ, and that in these species it is better to risk a large number of larvæ in the quest of new habitats, than that of, of course a large, but comparatively a much smaller number of adult females.

Why this should be so in these species and not in others may be simply that these are examples of the various ways in which Nature achieves her objects, but much more probably it is due to the danger of the female not finding a satisfactory position for laying her eggs, if she went in search of it, being decidedly greater than the average. In what the additional danger consists it may be difficult for us to discover, but in some cases we may make highly probable hypotheses.

I may repeat here that in the Lepidoptera no males are wingless, only the females, so that the danger to be avoided is not one affecting all individuals of the species, but only those with the duty of placing the eggs in a suitable position. This seems at once to disqualify all general dangers, such as storms of wind blowing them away, which would damage the species as much if the males were blown away as if the females were, and being less heavy they would be more liable to this danger. Torpidity due to a low temperature would injure the species as much through the males as through the females, and so the suggestion that a female chilled at a distance from a suitable site for egg-laying would never be active enough to find one,* seems inadmissible, for equally the male would be so chilled that he could not find the female.

What, then, are the reasons why the females' power of flight should be lost. These are probably different in different cases. Some we may fail to guess, in others we may believe we have a more or less satisfactory explanation.

It is necessary, then, to consider these more in detail.

In the first place, it may be mentioned that no case of apterousness occurs amongst the butterflies, the sphinges, the pyrales (*Acentropus*, sometimes *Brachypterous*), or the plumes, nor, I think, the noctuæ, *Agrotis fatidica* is perhaps the nearest to apterousness, this is true of British species and of European, and, so far as my knowledge extends, is generally true, but this is too wide an assertion to found on my ignorance of exotic species. The Geometers provide the largest number of species (European), if we omit the Psychids, of which all species

* This is the hypothesis advanced by Mr. G. V. Hudson (*Ent. Mo. Mag.*, 1912, p. 269), to which I shall refer later.

macro and micro (*Psychidae* and *Talaeporidae*, of Staudinger's Catalogue) have apterous females. *Narycia (monilifera)* and *Diplodoma (marginipunctella)* are not Psychids, though so placed by Tutt. *Melasina* is very close to it, if not actually a Psychid, but the female is winged, and there are several other allied species.

These Lepidoptera (chiefly palaearctic) with wingless females may be classified very much as follows—

1. Lay their eggs on or in their cocoons or pupa cases. Emergence of imago in summer (spring and autumn but to the summer margin).
 - a. Psychids, macro and micro.
 - b. Heterogynids.
 - c. Orgyias.
2. Moths appearing in winter, or in very late autumn, or very early spring.
 - a. Geometers. *Anisopteryx*.
Hibernia. *Cheimatobia* and various *Bistoninae*.
 - b. Tortrix. *Exapate congelatella*.
 - c. Tineæ (2 genera). *Cheimophila (Salicella)* and *Chimabacche (fagella and phryganella)*.
3. Certain Alpine or mountain species.
 - a. *Hepialus pyrenaica* and *alticola*. *Agrotis fatidica*.
 - b. *Thamnonoma loricaria*.
 - c. *Gnophos glaucinaria*.
Pygmaea fusca.
 - d. *Aretias*. Appearing in late autumn or early spring.
Oenogyna (European).
Metacrias (New Zealand).
4. Desert species.

Lambesia standingeri (appear September).
Chondrostega vandellia (appear August).
Somabrachys (appear September and October).

I may have omitted a species or two, my object not being to make a complete list, but to suggest some reasons for the apterousness.

The Psychids have apterous females throughout the whole family without exception (except perchance *Melasina*, which is very doubtfully a Psychid). Two points strike us at once, Psychids are distributed all over the world, whence it follows that they are an ancient family, and that the apterousness of the females has been a decidedly successful arrangement, the latter conclusion is supported by the fact that amongst the micro-psychids, which are the least specialised, the females have legs, even rudiments of wings, and emerge from the pupa skin and perch outside the larval case, whilst the more specialised, and therefore more recent, have females that have no appendages whatever and do not completely leave the pupa case until they have laid all their eggs, the progress, therefore, has been to intensify the helplessness of the females as time went on.

The very ancient origin of the condition, under circumstances that perchance we cannot very well form definite ideas about, places a decided difficulty in realising what the advantage of the deprivation really consists in. The family probably arose in common with the

groups of *TINEÆ* (clothes-moths) that make cases. We must suppose that such a moth at times laid her eggs in the larval case from which she had emerged, the pupal skin falling away, if this were advantageous it would be selected, and when once a species with this habit existed, the loss of wings would follow, both because they would make a useless call on the resources of the insect, still more because they might lead to her flying off and then laying no eggs in so suitable a place. It is easy to suppose that a rubbish-eating *Tinea* would be advantaged by laying her eggs where she was bred, if we grant that the rubbish would persist in the same spot, and probably it did for the early Psychids, as it must necessarily do now for such species as various *Talaeporias*, etc. The rubbish-eating and case-making *Tineæ*, as, for example, those eating fur and wool, having habitats that can only last a season or two, and those eating dead insects, etc., as *Narycia* and *Diplodoma*, which have to be sought for, necessarily require wings. These are so near the micro psychids that Tutt and others have placed the two genera mentioned actually in the Psychids, it is, at any rate, highly probable that these *Tineæ* are the nearest representatives we have to the common stock from which they and Psychids are derived. We may suppose that some of the rubbish-eaters took to eating lichens and conferve on rocks and tree trunks, when their proper food, dead debris of insects, etc., was scarce, and once this habit was established, we have them on a fixed and more or less permanent habitat, with possibly no other for a considerable distance, so that it became desirable that the females should as to the majority stay and lay their eggs there; this, of course, leads directly to apterousness. The restricted nature of the habitat, and limited quantity of food available, might lead, before the lichen habit was well established, to the rise of the higher Psychids, by way, perhaps, of such forms as *Fumea*, on certain individuals taking to eating surrounding green vegetation. It is to be remembered, of course, that lichens, etc., are actually vegetables, plants, though partaking, perhaps, from a dietetic point of view, largely of fungus or animal nature, not too far from the dead insect material of some of the *Tineæ*. Tree-trunks and rocks are unquestionably the true habitat of the micro-psychides, though they now find extended areas on walls and palings. Time and space hardly admit of going into such detail as referring to *Talaeporia tubulosa* (*pseudobombycella*), whose larva eats dead insects and other rubbish, and even greenstuff, though it is an unquestionable micro-psychid.

As the family developed they no doubt found other advantages beyond this to account for the success of the Psychids as a family. There are various directions as to which one might speculate as to this, but the main point for the purpose of this note is perfectly clear, that the larval case, with its contained empty chrysalis case, is the very best place in which the egg can be laid, in moths having the habits of the Psychids. It is, of course, quite possible that there may be species that would be benefitted if they could throw aside the loss of wings and endow their females with flight, such species would, of course, since it is tolerably certain that the acquisition of wings is impossible, tend to gradually become extinct, and may account for the rarity of some species. The rarity of most of our macro-psychids in

England must not, however, be ascribed to this cause, as they all, I think, are common enough in various continental localities. It is due really to our climate, the Psychids generally, and especially the macro-psychids, being, if not subtropical, at least more at home and more abundant in regions much warmer than we enjoy.

We assume that the object of apterousness in female Lepidoptera is to secure with greater certainty and least expense that the eggs shall be laid in the best locality. The primary, indeed the indispensable quality of the best position is that the young larvæ when hatched shall have a fair chance of getting a living, it is hardly less important, and is prior in point of time, that the eggs shall be protected from enemies between the dates of laying and hatching. The usual precaution with lepidoptera is that the eggs shall be small and inconspicuous, and laid singly, so that if many perish, still many will escape, there are many adjuvant devices, as protective coloration, covering them with scales, placing them in crevices, etc. What the protection in the case of large eggs laid in mass, as those of *Lasiocampa quercus*, is I can't say, and as a matter of fact it often happens that most eggs in such a mass produce hymenopterous parasites. As regards the Psychids, the placing of the eggs in the case seems to be a very efficient protection to the eggs. In the micro-psychids it is usual for the female to have a large tuft of hairs in the last abdominal segments, and when the female has emerged and sits at the extremity of the case waiting for fertilization, in many instances, if I recollect aright I have seen it most frequently in the Fumeas, the ovipositor rests in the opening of the case (or pupa-case) and the circular tufts of hair fully protect the case against the entry of any enemies. In the Fumeas, also, the pupa case is in the meantime rivetted to the opening of the larval sac, to fall back into it when filled with eggs, in the Talaporias the pupa case falls out and the eggs are laid in the larval sac.

In the Macro-psychids, the female is a mere egg bag, and never leaves the larval sac, but emerges from the pupa enough to open the pupa case and the mouth of the sac sufficiently for the male to introduce his long and extensible abdomen. Without any exception, either in micro- or macro-psychids, that I know of, the eggs when laid are intimately intermixed with hairs and hair-scales, which must present almost insuperable difficulties to any assailant. This may be the dominant reason why the apterousness has made the Psychids so successful a family. It may be added that of the micro-psychids the females possessing, as they do, legs, and emerging from the sac, there are none that do not drop away when their eggs are laid. The females of the macro-psychids that do not completely leave their pupa cases till their eggs are laid finally come out when that process is completed, and fall to the ground as mere scraps of what they were at first.

Though the macro-psychids have evolved beyond the micros in the matter of the females being not only wingless, but also without legs or even antennæ, certain of the micros have made a further advance in another direction. The Luffias and Solenobias have formed species that are parthenogenetic. In regard to this, we may recognise two very remarkable circumstances. In both these genera the species are duplicated and go in pairs. To each species that still possesses a male,

there corresponds another species, apparently identical, that has no males, and is parthenogenetic.* It might at first be supposed that these were varieties of one species, but this is not so, the species possessing males have females that "call," and if the male does not arrive, die without laying fertile eggs, whilst the females of the parthenogenetic races do not "call," but commence laying eggs as soon as they have emerged. It is also the case, in some instances, that there are intermediate species that have few males and parthenogenetic eggs are not laid unless the males which are rare fail to attend. Though I call these intermediate races, species, I am probably wrong in so doing, they are probably distinct species that have left the species, that has an effective male population, but has not yet become completely parthenogenetic.

The other remarkable circumstance, which is one that probably occurs in several of these parthenogenetic races, has only been studied by me in the case of *Lujia ferchaultella*, the parthenogenetic form of *L. lapidella*. This insect may be regarded as one species or as a number of species. The really true test of a species, complete syngamy, cannot of course exist in parthenogenetic races, and it would be quite reasonable to regard every individual as being of a distinct species. Still one feels bound to regard all the individuals of one locality, generally a small group of rocks, walls or trees, as of one species. Why not therefore of, say, two different localities? The difficulty comes from the individuals in the two localities, though uniform in each locality, are different in characters so fundamental as the number of joints in their tarsi and antennæ. Changes in the number of the tarsal joints are very rare in Lepidoptera, the front tarsi differ in Nymphalids and Lycænids as characters of the families, and here and there in other groups, and in Coleoptera differences in the number of the tarsal joints distinguish families. In the case before us the loss of joints may be regarded as steps towards the legless condition in macro-psychids, but here again it is a family character, but in the case of *L. ferchaultella*, it is merely a varietal one, if we consider them all to be one species.

The *Heterogynidae* are a very small family of only one genus, and from one point of view only two species with various races, from another, perhaps of a dozen species. One species or group has a wide South European distribution, the other is purely Spanish. They seem to have no very near allies and are probably nearest to *Megalopygidae* and *Zygænidæ*. I have had favourable opportunities of studying both groups. The female moth is remarkable structurally and in her habits. She has not only no wings, no legs, or antennæ, but she has no scales or hairs, and has a smooth shining surface. I may be held to be wrong when I say she has no legs, still I describe her as having no legs either as a pupa or an imago, yet where these legs ought to be the imago remains attached to the pupa. If there are no legs there are at least some structures having the definite function of soldering together the imago and the pupal skin. There is a fine silken cocoon,

* A sufficiency of such species are known to justify this generalisation in the broad view that here interests us.

and on emergence the pupa protrudes from the cocoon, as is typical of the *Lepidoptera incompletæ*. The male pupa remains there in ordinary fashion, such as is the case in *Zygaena*, etc. When the female pupa case appears, the moth emerges from it, pushing forwards the portion of the pupal skin covering the front of the thorax and head, and backwards that covering the dorsum of the same parts. The imago is firmly attached to the front portion by the soldered legs, she emerges further by a vermiform movement until she rests on top of the cocoon, adherent organically in front and with the inferior surface of the abdomen adherent to the posterior flap of the pupa case by some slight moisture. Fertilisation now takes place, and in less than a quarter of an hour from her emergence, she may have returned to the interior of her pupa case, and that will at the same time have dropped back into the cocoon.

A cocoon at this period, and even its contained pupa, is very difficult to distinguish from one from which the moth has not yet emerged. She gets back into the pupa case by the same vermiform movement by which she emerged. The progress forwards of the inferior surface of the abdomen, along the portion of the pupa case to which it adheres is very slug like, and goes on till the end of the abdomen comes over the opening into the pupa case, and a continuance of similar movements now brings her inside it, when the flaps from back and front close together and the pupa drops back into the cocoon. This is extraordinary enough, and most interesting to watch. The further procedures, though taking place out of sight, are equally extraordinary. Since, unlike the Psychids, she has no wool to mix with the eggs, she lays them in a solid mass in the lower part of the chrysalis case, a mass so adherent that it is practically impossible to detach a separate egg. There she dies, held as she necessarily is by the adherence to the pupa case, between the eggs and the opening at the top of the pupa case, an opening, however, that is very closed by its two flaps overlapping. The curious arrangement of the legs then serves two purposes, to keep the moth in the proper place on top of the cocoon and ensure her safe return into the pupa shell, and to keep her there in the right place when she dies. For though dead she still has two important offices to fulfil. She has to assist the block protecting her eggs against parasites and marauders. But beyond this she has to afford their first meal to the young larvæ, her offspring, when they hatch. In the case of the species of the *penella* group, this meal is not apparently a large one, the species of this group are smaller and the materials of the dead mother not abundant, and the larvæ eat their way through the pupa case and get out of the cocoon hardly increased in size. But the other, the *paradoxa* group, are larger insects, and the dead female must present a considerable amount of food, for the young larvæ remain within the pupa-case consuming this unusual food, until they have passed their first moult.

A consequence of the complete loss of appendages in *Heterogynis*, and a more or less complete one in *Psychidae*, is that the males are of a uniform black tint in *Heterogynis*, and have a similar black tint in some species of *Psychidae*, and very generally a very uniform dull tint, with certain marblings in the lower forms with less degenerate

females, but also with a good deal of colour and marking in some exotic macro-psychids.

Are we to assume that the females here do not employ any sexual selection, are in fact so devoid not only of movement, but of any æsthetic taste, as to be careless of the personal appearance of their mates. This is a difficult subject, but the fact appears to supply the strongest argument (if it be strong) that I know of in favour of the hypothesis of æsthetic sexual selection in Lepidoptera. As a secondary result this loss of colour and marking in the males entirely deprives us of those characters, which we so much depend on in other families, for the discrimination of species. I think it highly probable that if the Heterogynids had colours and markings, a number of species, beyond the certain two, would have been easily distinguished.

Some authors state that the newly hatched larvæ of some Psychids eat the remains of their mother, but give no exact observations. My area of observation has of course been very limited, contrasted, with so large a family, but I know no species in which the female does not leave the case and fall to the ground when her eggs have been laid.

Both the Psychids and the Heterogynids belong to the less specialised incompletæ, but the *Orgyias* are of the really high family of the *Lymantriidæ*. They are almost a solitary genus in this family, whereas in the other two families the whole family without exception is involved. It follows that their loss of wings must have been of very ancient date, whereas in *Orgyia* it must be comparatively modern.

Our most familiar *Orgyia antiqua* lays her eggs on the outside of the cocoon, on which she rests during her whole imaginal existence. She has good legs, which she hardly uses, and little more than vestiges of wings. The eggs are very hard and well calculated to stand vicissitudes of weather and other dangers for eight or ten months. They are nevertheless attacked by parasites. It is difficult to feel at all sure of the advantage gained by the eggs being on the cocoon, compared with, for example, being on the bark of a tree. It probably prevents their being soaked with wet, for more than a brief period; the cocoon is also placed most frequently in a somewhat sheltered position, and the silk of the cocoon may be unpleasant to some enemies. Whatever the advantage is, it is no doubt made more certain by the female being apterous. The general abundance of the species, moreover, shows that the arrangement is a very satisfactory one, whether or no we can guess how.

The other species of *Orgyia* vary to more complete apterousness, and to comparative absence of legs, antennæ, etc., and to the female never emerging from her cocoon. I don't suppose the present species are derived from each other in linear series, but we may arrange them in order of their specialisation. *Gonostigma* makes a loose outer cocoon of, often, considerable dimensions, within which is the true cocoon corresponding to that of *O. antiqua*. The female rests on this, but to reach her the male has to crush himself through the meshes of the outer cocoon, she lays her eggs on the inner cocoon, but less regularly than does *O. antiqua*. The *ericæ* group have females that never emerge from the cocoon, but the male does not enter it, it corresponds possibly to the *antiqua* cocoon, the female makes an opening in the cocoon

through, which pairing takes place; there is some reason to believe, however, that this species passed through the stage we find in *auro-lymbata*. In this species the cocoon has two chambers side by side, in one of which the insect pupates, and as an imago passes into the other, it seems right to assume that the pupal chamber corresponds to the *antiqua* cocoon, the imaginal chamber, to that beneath the outer cocoon we find in *gonostigma*. In *aurolymbata* the male tears a way through with his strong anterior tibiae into the imaginal chamber, in which afterwards the female lays her eggs.

In *splendida* there is only one chamber to the cocoon, in this the female tears her pupa case to pieces, makes a small practicable opening at what we might call the emergence end of the cocoon, through which the male forces his way, squeezing his very handsome wings together into a straight bundle. One is surprised to find how little they are damaged when he emerges some twelve hours or more later.

There is a species, *Hypogymna morio*, about which I know practically nothing, which is supposed to be close to *Orgyia*, whose female has wings about half a normal length, and is said not to emerge from her cocoon. The male corresponds to *Psyche* and *Heterogynis*, in being nearly unicolorous black.

This whole group, unrelated as they are to each other, agree in being day-flying moths, and in emerging in summer, at any rate not in the wintry side of spring or autumn. *Orgyia* being the only form with near relatives, is the only one in which we can say that, though it is day-flying, all its relatives are nocturnal in their habits. *S. salicis* is in some degree perhaps an exception to this.* Is the day-flying habit a dangerous one for female moths? Did it become necessary they should stay at home, and so laid the foundation for becoming wingless? One can understand that they would fly more slowly and heavily than the males, and if they belonged to a palatable race would suffer severely from birds.

In approaching the winter moths I must refer to Mr. Prout's paper read to this Society in the early part of this year, in which he explained my views about them more clearly and succinctly than, I fear, I can do myself. This discussion is in fact due to the interest in the subject that Mr. Prout's paper aroused in the Society.

It was in regard to this second group, the "Winter Moths," that I framed a theory about the advantages they gain by winglessness, and gave a short explanation of my views some thirteen or more years ago. I assume, as in regard to all other wingless lepidoptera, that the object is to enable the female to secure the best position for laying her eggs, the question is how does it secure this object.

I give a list of the British species that come within this section, I do not include all European species, as I do not happen to have any direct knowledge of them, but I think they are almost all near relatives of one or other of our British examples. The list shows twelve geometers belonging to four different sections, one Tortrix, and three Tineids. We may conclude that the wings have been lost in these six divisions,

* *Monacha* and some others have been recorded as flying by day, but it is not the usual habit in these species.

not by one ancestor for all of them, but in at least six different instances.

The species are—

- | | |
|------------------------------------|--------------------------------|
| a. <i>Hibernia ruficaprararia.</i> | <i>Hibernia leucophaearia.</i> |
| " <i>aurantiaria.</i> | " <i>marginalia.</i> |
| " <i>defoliaria.</i> | |
| b. <i>Anisopteryx aescularia.</i> | |
| c. <i>Phigalia pedaria.</i> | <i>Apocheima hispidaria.</i> |
| <i>Nyssia zonaria.</i> | <i>Nyssia lapponaria.</i> |
| d. <i>Chimantobia brumata.</i> | <i>Chimantobia boreata.</i> |
| e. <i>Ecrapate coniolatella.</i> | |
| f. <i>Chimabacche fagella.</i> | <i>Chimophila salicella.</i> |
| " <i>phryganella.</i> | |

I have been at one time or another tolerably familiar with most of these apterous winter species, but much of the knowledge so acquired is of old date and did not include some of the species, so that when I generalise and make statements in regard to them collectively, that, I believe, fairly represent the facts, I am quite prepared to find that some species or other is an exception.

The point that is almost as prominent in them as the want of wings is that they can walk and run, and do walk and run, with a rapidity, energy and persistence that we hardly find in other species. In many *Noctuas* and *Tineae* the legs are strong, and a dash may be made to escape an enemy, that the winter moths cannot rival, but it is spasmodic and the wings are resorted to immediately in most cases.

Accepting the fact that the chief object in life of these moths is to lay their eggs in the right place, we are forced to conclude that this object cannot be attained by the aid of the wings, but by means of the legs, that the possession of wings endangers the attainment of this supreme purpose. If wings were a danger from any other point of view, as, for example, making the moth conspicuous to its enemies, we may feel sure that this danger would have been overcome in some one or other of the ways in which it is dealt with so variously and successfully throughout the *Lepidoptera*. To enable the moths to hide has been suggested as a reason, but the males of these moths, often very abundant, hide so perfectly that practically one rarely sees them during the day, in fact, during the day it is about as easy, or even more so, to find the females in crevices of bark, etc., as to discover the males.

How, then, would wings interfere with the laying of eggs in the right place. Clearly because she might fly away and could not come back, either to the same spot or to another equally satisfactory. What is to prevent her finding a proper food-plant on which to lay her eggs, which does not affect moths at other seasons. Mr. Hudson advances the view that the difficulty is that the moths would get chilled away from the food-plant and would not recover sufficiently to find it again. The habit of female *Lepidoptera* is to rest where they have dried their wings after emergence, or in many cases to take a very short flight or travel on foot to some safer station, but never to take any prolonged journey until they are fertilised. If a female moth is captured on the wing, one expects her to lay fertile eggs, and one is rarely dis-

appointed. Before being fertilised, then, she does not go far from the food-plant. Afterwards her flights are always from one place where she lays an egg or eggs to another, and when her flight for the day (or night) is over she rests somewhere near where the last eggs were laid. It is quite conceivable that a sudden storm or change of temperature might catch the moth whilst in flight between two acts of oviposition, but this would be rare, moths have a powerful instinct against taking wing when such things are likely, as moth collectors well know, and they would almost always be caught at rest on or close to the place where the last eggs were laid. Further, these moths are very hardy and would not suffer much except in such bad weather as would be fatal to them whether they were winged or not. The danger no doubt exists, but is quite too slight to justify such a fundamental change of structure and habit as the loss of wings.

How does a moth find its food-plant when it has to lay its eggs on it? Butterflies certainly are in some cases guided by sight to the right place, they are often deceived, however, in this way and always verify the matter by some other sense, almost certainly smell. A butterfly may be seen to fly towards a bush, approach it closely, even fly round it a little, if it is not the right one, she then flies off; if it is the plant required she continues her investigation and finally lays an egg. Moths at night can hardly do much by sight and must be guided to the right place almost entirely by scent, and in the growing season many plants have very powerful scents and probably none are without them. We know, further, that scents which we are unable to detect are very strong for insects, as, for example, when males will semble from very long distances. But in the winter season the scent of plants must be very much slighter than when they are actively growing and we should probably be not far wrong if we held that deciduous shrubs and trees held no scent at all, or but the faintest, only to be detected at close quarters. The great majority of these apterous winter moths feed on trees and shrubs, the two *Nyssias* being the only exceptions, perhaps also *D. salicella*, which I have reared from birch, it feeds also on other shrubs and trees. It is a question, therefore, of finding these shrubs or trees, none of them, though some are rather omnivorous, including any "low" plant in their dietary.

If a moth flew away from the desired tree or shrub, she would be too far from it, or another example to find it by scent, and would only do so by unlikely accident, would in fact be lost and perish without laying any more eggs. The real cause, then, of these moths being wingless is that the trees or shrubs on which they feed are during the winter leafless and quiescent and without appreciable scent. It may be asked, if they can't do it with wings, how can they do it without. It might be a sufficient answer to say that as a simple matter of fact we know that they do do it. It is, however, interesting to consider the "how." We have noticed that they are excellent walkers, and it is probable that, like other lepidoptera, they prefer walking uphill, this would bring a moth that had fed on and pupated under say an oak tree, if tolerably near it, to ascend the earth raised near it by its growth and once on the tree to ascend it. Any one who has seen the swarms of *C. brumata* that sometimes cover the stem of oak trees on a

suitable evening can only marvel on how so many manage to find the trees. We may nevertheless imagine that many fail to find their ancestral tree and wandering on the ground reach another one, since, as Mr. Hudson notes, the trees and shrubs affected by these moths generally grow in woods, thickets or hedges, so that an alternative tree is fairly likely to be found. As many moths, no doubt, miss the trees of their own wood or thicket altogether and travelling away in, for them, a desert country, largely perish, but a few get to another thicket or hedge or to some isolated tree. In the latter case, the solitary tree will henceforth be peopled by the species that has found it and will send forth emigrants to find solitary trees further afield.

It has been suggested that the males carry the females to the desired trees, but the evidence is wanting. Were it the case, so common are these moths in their entirety that the evidence would be abundant. I once spent several evenings when *C. brumata* was abundant, netting all I could, but not one of the males caught introduced a female into the net. There can be no doubt that a pair disturbed high up on a tree might volplane down in some parachute manner, and I have no doubt the few, very few, instances in which the females have been reported to have been carried, were carried in this way. If the females were to be carried by wings we should no doubt have found that their own wings were the proper ones for the purpose, it may also be noted that the males have relatively large wings but weak bodies, to suppose that *C. brumata* could carry the female except in a parachute manner is to suppose that work can be done without any sort of apparatus or engine. Orchardists have long known that their trees are completely protected against the larvæ of these moths if the females are prevented from ascending the trunks, and this is done by circling the stems with some adhesive material, and I have heard of almost fabulous numbers of the moths being arrested on the glutinous material and there perishing. I ought, perhaps, to notice the contribution to this question by Dr. Wood, one of my greatest friends and a wonderfully acute observer. His conclusion is "that the wingless condition, wherever it shows itself, is owing to an overpowering dislike on the part of the insect to use its wings, whatever may be the provocation." We may accept this as correct, if we add what was probably in Dr. Wood's mind, though he did not state it, perhaps because he regarded it as self-evident and accepted by every one. The further point is that natural selection shall favour those insects who do not use their wings, and decimate those who do. Though it may be questioned whether the mental state of the insect precedes or follows the gradual dwindling of the wings, probably they proceed *pari passu*.

Dr. Wood's view is not, in its essential attitude, perhaps very different from that of Prof. Poulton, though the Professor states his in a way that almost convinces one against his will.

Mr. J. W. H. Harrison has paid a very great deal of attention to the *Bistoninae* from many points of view; his experiments in hybridising some of them are known to most of us, though far from all of them are fully published; this is not, however, my present subject, but I have had the pleasure of a short correspondence with

Mr. Harrison bearing on winter moths, and I have gathered two facts that were new to me in their bearing on winter winglessness. One is that all the *Bistoninae* that have wingless females come out in early or late winter, or approaching it. The second is that the males of these have plumose antennæ, which were also very marked in the forms in the late tertiary dispersals of the group, although the females had wings.

The curious point here is that the strictly winter moths, *Hibernia*, *Cheimatobia*, etc., other than *Bistoninae* have, males that are not supplied with specially plumose antennæ; Mr. Harrison tells us that in the *Bistonina* plumose antennæ in the male were earlier characters than apterousness in the females as in the ancestral "*Biston*," *Megabiston plumeraria*. He says, "In the late tertiary dispersal of the *Bistoninae* the forms developed had enormously large plumose antennæ in the male. These were not accompanied by apterousness in the female." He notes that other winter moths, such as *H. pennaria*, *Pt. plumigera* and even *P. populi*, etc., have highly plumose antennæ. He agrees with me (or I with him) that these antennæ were very necessary in winter moths, to enable the males to find the female in a cold atmosphere in which scent disseminated badly.

I may say that I have had this view for a long time and consider it the dominating reason for these plumose antennæ, without altogether discarding, but regarding as secondary, the view that first occurred to me, that it was a male reflection of the necessity to female winged winter moths to have a highly developed power of detecting scent. As a matter of fact the wingless winter moths, even in the *Bistoninae*, have less developed antennæ in the males than those of species with wings. It seems probable that when the females became wingless the males had not to travel so far, and therefore not to search under so many difficulties as they had when the females were winged, and so the male antennæ returned to a less extreme development. It may be observed also that the typical wingless moths are feeders on trees and shrubs that are of gregarious habits, and that, further, most of the species have been so successful as to be more or less abundant, and so the finding of a female, in spite of scanty scent, can be no difficult matter. The wingless moths with most plumose antennæ are the *Bistoninae*, of which the *Nyssias* are hardly tree feeders.

The more simple antennæ of the wingless winter moths is rather adverse to one point in Mr. Harrison's view, that the plumose antennæ led to the females being loth to use their wings, and so led to their being apterous, though, as in Dr. Wood's very similar view, it might give natural selection some material to work on. The view of plumose antennæ in winter moths that seems to emerge, is that in winter the male requires very plumose antennæ to detect the scent that a cold (and therefore dry) atmosphere represses; but that as the females become wingless and so successful in life that the individuals of a species are generally and especially locally abundant, the necessity for highly developed antennæ in the males is much less and they accordingly dwindle. The flaw in this seems to be that in some cases, *Hibernia* and *Cheimatobia*, as probable examples, there never were very plumose

antenna; we can only meet this by remembering the fact that nature meets apparently the same difficulties in many different ways.

Mr. Harrison briefly, in a letter, outlines his views as below, doubtless he would amplify this in various ways in a less restricted statement. He says:—"My order of reasoning was—

"1. In winter the likeliest ♀ moths, to survive and to have progeny, were those that flew little.

"2. This means that the male would have to develop great sense organs to find them in the absence of powerful scents in winter.

"3. Lack of use would cause the wings to tend to vanish in the female.

"4. Possibly sooner or later the female scent would intensify, with a subsequent decadence of male antennæ."

I accept all this, suggesting that the females flew little in order to keep near the scentless food plants. That though the females developed scent enough the cold dry air diffused it imperfectly.

I add the names of certain winter moths that are *not* wingless, it may be of interest to speculate why these species did not also become wingless. It may be observed with regard to them, that whilst of the sixteen apterous species only three or four might be regarded as of late autumn or early spring, there are only ten of these winged species, and of these four belong perhaps rather to early spring. Of the strictly winter species only one is a Geometer (*H. pennaria*), it is not closely related to any of the wingless forms, yet the female shows a strong tendency to the wings being small and weak. Four others of the six really winter species belong to sections that show no apterous species, at least in our British list, nor I think anywhere as "winter moths."

Winter moths (British) that are winged.

1. Hardly winter—

A. hirtaria.

A. strataria.

A. nubeculosa.

S. avellanella.

2. Have no near relatives (wingless) among winter moths.

A. sphina.

Pt. plumigera.

L. lanestris.

P. populi.

3. *Ch. tortricella*, very late winter, perhaps related to *E. congelatella*.

H. pennaria, related (but not nearly) to some (wingless) winter moths.

The Alpine wingless moths may be more numerous, but the only forms I know anything of are certain *Hepiali* and species of *Gnophos*. The latter I have several times bred from larvæ and pupæ found under stones at considerable elevations, 8,000 feet to 9,000 feet. There is also the curious little Geometer, *Pygmaena fusca*, which occurs much lower down.

The other moths I have associated with these are hardly alpine and hardly winter moths. Mr. Hudson, indeed, classes the Arctiids of the

New Zealand genus *Metacrias* as winter or alpine, but the genus *Ocnogyna* is perhaps partially both, but certainly not altogether either. It is perhaps because I know little about most of these that they seem to me hardly to come strictly under one heading, when we try to find some reason for their being apterous. They all, I think, feed on low plants (*Hepialus* underground), but whether these are local or widely distributed, or whether all or only some of the species are more or less restricted to one or a few food plants, which would localise them, I don't know.

The female of *Hepialus pyrenaica* appears to have wings nearly half the normal length, but is quite helpless as regards flight, much the same degree of winglessness as in *Agrotis fatidica*. I have not said so already, I think, but I use the term winglessness as meaning not having wings useful for flight, although they may be very recognisable as wings, as is even the case in some of our winter moths. The male is said to be a day-flyer, but I have never met with it on the wing. I think I should have done had it been a day-flyer. The female, if she flew, would probably be nocturnal.

The Geometer, *Gnophos glaucinaria*, is very alpine, and might therefore be called a winter moth, substituting elevation for season as producing a low temperature. The female is heavy, but fairly able to march, especially after she has laid some eggs. As making it a winter moth, it is interesting to note that its habits are nocturnal, whilst *Psodos*, another genus of alpine Geometers, are all day-flyers, their alpine habitat does not therefore give them winter conditions as it does to *Gnophos*, and their females are all winged.

Pygmaena fusca I have often seen, but its habits, so far as I know them, do not suggest to me why its female should have short, useless wings. The male has well-pectinated antennae, it flies during the day, and is of dark tint, almost Psychid like. The female is also active by day, running about amongst the herbage. It appears in July.

I know nothing about the Arctiid genus *Metacrias* (New Zealand), which Mr. Hudson regards as belonging to the winter moths. The European genus *Ocnogyna* has species very similar in appearance, all the species have apterous females, most of them are mountain species, but not alpine, and their distribution is somewhat southern. With them we may associate *Cymbalophora haroldi*, which is no doubt closely related to them, though placed by Oberthür in the same genus as *pedica*. It is one of the Algerian species I have now to refer to.

The alpine apterous moths may have the same difficulties of finding the food plant as our winter moths, as alpine nights are very cold, and plants would certainly not provide scent as during the day, or as many plants do where the nights are warm at lower levels. They may be also to some extent in need of defence from the danger of wandering to lower levels, where they could not long survive.

With regard to these Algerian Lepidoptera with apterous females, I have had the pleasure and advantage of receiving from Mr. Harold Powell some interesting details. Mr. Powell has probably seen more of these species than anyone else, and it need not be repeated that he excels as a careful and energetic observer. I cannot do better I think

than quote what he says:—" . . . I have often wondered what was the cause and what the advantages of their apterousness. The Hauts Plateaux, in Algeria, are almost continually swept by violent winds, mostly from the S.W. and W. Trees are rare, and there is not much protection afforded to moths and butterflies beyond that of the clumps of Alfa grass and *Artemisia*.

"In only one of the species I know is the habitat rather restricted, that species is a *Chondrostega*, I found at Geryville and at Aflou, which Mr. Oberthür named *porcelli*: it is very near *constantina*, whose habits are no doubt very similar. Both *porcelli* and *constantina* live on *Thapsia garganica*. At Geryville the *Thapsia* did not grow everywhere, but only in certain parts of the plain. At Aflou it was less localised, but still there was a good deal of ground on which no *Thapsia* grew. I never found the females of *porcelli* wild, although I often searched over likely ground, where the males came commonly to light. I often found the egg-masses, the eggs ranged in a broad ring round a stem of Alfa grass or on a twig of *Artemisia campestris*. I bred two ♀s from the larvæ I collected on *Thapsia* when I arrived at Aflou in May. Of course at the time the ♀ lays her eggs all the *Thapsia* has dried up and disappeared, excepting sometimes a dead seed stem. The plant comes up again after the autumn rains. With regard to *Lambesia standingeri* and the *Somabrachys*, the habitats are not restricted. *Standingeri* flies in the semi-desertic plain and on the dry hillsides, and comes to be pretty widely distributed. Its larva feeds on *Helianthemum*, one of the commonest plants of the highlands. There is a nearly allied species, *decolorata*, or *latini*, with a winged female which lives at El Kanera and Biskra in a hot climate, but Lord Rothschild has a variety of *decolorata* from Guelt-es-Stel, on the Hauts Plateaux. *Stanlinari*, with its apterous ♀, does not leave the highland region.

"The *Somabrachys* are very widely distributed, some of them being highland species, while others live on the coast or in the fertile Tell region, with a climate something like that of Hyères. As far as I know all the females are wingless. The larvæ of *Somabrachys* are not at all particular as to what they eat, most of them prefer flowers or flower buds. I should not think it would matter much where the female laid her eggs, the larvæ would be sure to find something to eat. I have found larvæ of the same species on such different plants as oak, *Phlomis*, *Acanthyllis*, and a species of *Compositae*.

"There is another moth the ♀ of which has only tiny wings and is quite unable to fly, that is *Cymbalophora haroldi*, Obth. It seems to be extremely rare except at Aflou, where it was so abundant in 1911 that the larvæ did great damage to the barley crops, but only over a few acres of ground. Away from Aflou I think only three specimens have been taken, two at Lambessa by myself and one at Guelt-es-Stel by Farault.

"The larva of *haroldi* feeds on grasses, and I don't know why it should be such a rare species.

"The several *Trichosomas* inhabiting Algeria have nearly wingless females. There is a good proportion of species with wingless females (including *Psychids*, *Heterogynas*, *Orygia*, etc.), in Algeria, when one

comes to think of it. Excepting perhaps *Trichosoma boeticum*, which hatches out in November, none of these moths are winter species, August and September are their months (barring the *Orgyias*). The *Chondrostega*, *Lambesia* and some of the *Somabrachys* are semi-desertic species, for they live on the steppes of the Hauts Plateaux, where the ground is very dry and vegetation is low-growing and thin. The climate on the Plateaux is hot and dry in summer, much hotter than at Hyères, and with violent winds. In winter rain falls at times, but there are long spells of dry weather and the air is generally very dry, it often freezes hard and snow falls, but with a sudden change of wind the temperature may go up 15° cent. in a few hours."

I think we may, from Mr. Powell's lucid notes, rank *Chondrostega* with the winter moths in so far that its food plant is undiscoverable when the female wants to lay her eggs, and she has to lay them on any convenient object, and the winglessness secures that it shall be not very distant from the umbelliferous food plant when it comes up.

It may be called for our purposes a "Desert Moth." How far the other species that Mr. Powell tells us of are also "Desert Moths," as regards wingless necessities, is not so evident, but it seems highly probable that they are so.

There can be little question that most Lepidoptera extend their distribution, repeople places where they have died out, and colonise places that have recently become suitable for them, by the females reaching the new localities on the wing. How is the distribution of the apterous moths achieved? When the moths lay their eggs in the cocoons, it is obviously not by the enterprise of the females, and can only be by the travelling of the larvæ from place to place. The larvæ of some of the Psychids and of the *Orgyias* are sufficiently active to make this a totally satisfactory explanation, but one does not feel that it can apply to all the micro-psychids. Our old friend *Luffia ferchaultella* is perhaps as difficult a case as any, its travelling as a larva cannot be very extensive, yet it occurs on rocks and trees far separated from any possible source from which immigrants could come, the intervening country being quite unsuitable to maintain the larva during its travels, so far as we can judge, it seems necessary to suppose that they are carried somehow by birds or by insects. It is true that there are many suitable, or apparently suitable, localities where they do not occur and have apparently never reached. This might be the case, however, even if they were not infrequently carried in some way.

As regards the winter moths, there can be little doubt that all the travelling is done by the active females. This seems unquestionable in such a case as that of *C. brumata*, where the larva lives between leaves and is decidedly sluggish, but even in such insects as *Hibernias*, and *hispidaria*, and *pilosaria*, the larvæ have no tendency to leave the trees on which they were hatched.

Professor Poulton has in the *Linnean Transactions* (vol. v., 2nd series, Zoology, pp. 248, 251), in his second paper on the "External Morphology of the Lepidopterous pupa," an examination of the question of Degeneration in Female Imagines of Lepidoptera. He concludes that such degeneration is of recent date. So far as my knowledge

extends I fully agree in this, as regards, Orgyias, Aretias, Geometers, and most others, the degeneration took place not only after the families to which they belong were fully evolved, but even the subfamilies and tribes, and in some cases, as for example the genus *Gnophos*, after the actual genus was differentiated. But to this the Psychids at least are an exception, as the whole family is involved, it is a very distinct one, and has no relations nearer than certain, by no means highly evolved, Tineids. In this family we may see various stages and different lines of evolution (degeneration) of the loss of wings, passing in one direction to the almost amorphous females of the higher Psychids, and in another to the parthenogenetic races of *Lufja* and *Solenobia*. Here the early date of origin has given time for evolution in various directions.

Professor Poulton points out that when both sexes of Lepidopterous imagines feed, the power of flight is much the same in both sexes, but where they do not feed, then the female is more sluggish than the male and tends to develop a larger supply of eggs. This is clearly a first stage towards apterousness, but can go no further without some adjuvant circumstances with which we are poorly acquainted. For instance I suggested that *Aretia caja* usually lays her first batch of eggs where she is fertilised, this is obviously a second stage towards winglessness, provided the larvæ of this first batch have a distinct advantage in life over their brethren, probably, however, the facts are the other way, since the female does not select the position for these eggs but does for those that follow. The two genera of wingless Aretians, one European one in New Zealand, may have reached apterousness by this route.

The Lasiocampids that are a most prominent family, as having very heavy and sluggish females but very active males, have no apterous female in European species, there is apparently one in South Africa. The equally heavy-bodied Saturnids have, I believe, no species with wingless females. As regards the heavy bodies of apterous female Lepidoptera, we are subject to be misled by the fact that these moths have not only no wings, but none of the muscles necessary to energise them, and in consequence the appearance of a very heavy body is largely, or even entirely, the effect of a very small thorax. We should think the body of a female *carpini* inordinately large if the thorax was of the size that of say *T. pronuba*, or an *A. caja* with a thorax of *D. sanio*, which would I fancy be about the dimensions if those species were apterous.

Professor Poulton applies the same views to winter moths of the Geometræ. He regards them as having very heavy bodies, taking into account what I have just said as to the male thorax, I doubt whether this is so, and their great pedestrian activity could hardly be exercised if it were excessive. His actual view seems to be that the Geometers have feeding imagines and so fairly equal wings in both sexes; for the winter moths, however, feeding is impossible, therefore the females have less use for their wings and lose them. There is, however, a more important use of the wings of the female moth even than feeding, and that is finding a proper place to lay her eggs, if in a winter climate, to

try to use the wings for this purpose is disastrous, then the forces working for their loss are very strong. These two views are by no means mutually exclusive, it is not necessary to say that one is all sufficient, the other totally wrong. If the wings are to be lost because they offer a danger to oviposition, the tendency will be assisted if they are no longer useful for reaching flowers or other food. Professor Poulton notes that they are apterous because the wings are not wanted for feeding, for courtship, or for oviposition. The addition to this that seems necessary is that wings are not only not wanted for oviposition but would disastrously interfere with it.

It has a rather indirect bearing on the question of winglessness, but the relationship of non-feeding imagines and large size of abdomen in the females, has other aspects than that in Professor Poulton's paper. He says it enables the female to lay more eggs and larger ones. The more eggs is rather in appearance than fact, and as to size, many Spingids lay eggs fully proportionate to their size, as are those of say the Lasiocampids, some of which lay very large eggs. It is far from certain that giving up feeding is the first point in the correlation, something may be said for the non-feeding being secondary. The real difference in the two groups is that the non-feeders have all their eggs fully developed when they emerge from the pupa, and have only to have them fertilised and laid, the egg-laying may be leisurely as regards the movements of the female, but is rapid in so far as that it is soon completed, and the female is very short-lived. The result is no time nor necessity for feeding. The feeding groups have many species with the eggs well developed on emergence, but they have probably a majority of species in which only some are fully developed, and the moth is long-lived and goes on developing more eggs, and feeds rather to maintain her own existence than to supply material from which eggs may be matured. In the end, however, producing as many or more eggs than the non-feeding species. I remember keeping a specimen of *Xylina socia* that lived many weeks, and several times laid eggs till she seemed hopelessly hollow, yet afterwards laid more, receiving no food other than syrup; I recently reported a specimen of *Callophrys aris* that lived five weeks in captivity and laid fertile eggs within a week of her death. The egg-laying of the feeders is therefore more protracted, because in certain feeders many eggs have after emergence still to be matured, than in any non-feeders. The sequence of causation would therefore appear to be at least as probably, that a short life suffices to lay already matured eggs, as that abstinence from food rendered the maturity of all the eggs together a possibility. We may, however, reflect that this is largely a mistaken view of the question, since neither the non-feeding nor the maturity of the eggs on emergence was fully advanced before the other commenced, but both must have advanced more or less together. The eggs, let us say, gradually assumed a simultaneous maturity, and equally gradually the necessity for feeding disappeared.

In the *Archives für Naturgeschichte*, lvii., i., p. 49, is a paper of 26 pp., with a plate by L. Knatz "On the origin and causes of winglessness in certain female Lepidoptera." After rather elaborately

describing the condition and classifying them on certain lines, he proceeds to explain that Lepidoptera of most species have individuals that from various causes fail properly to expand their wings, are, in fact, what we know as cripples. He says the males necessarily fail to find the females and leave no descendants, the female cripples are, however, found by the males and have descendants, which he postulates tend to be cripples as regards the females, but not as regards the males. Hence arise races with wingless females, which flourish because they are less exposed to attack by enemies, and having, also, smaller thoraces, have larger abdomens and lay more eggs. This theory hardly seems to require any criticism to destroy it.

Cripples are weaklings, either inherently or owing to some adverse circumstances, and so are unlikely to survive in the struggle for existence. It may be noted, by the way, that he deals with cripples as due to adverse circumstances and therefore postulates inheritance of acquired characters.

The crippled female usually fails altogether to place her eggs in a favourable position, which again is against survival of the strain. And the argument is of so general a character that if there was anything in it all Lepidoptera ought to have apterous females.

He includes as having females with defective wings such species as *Cleogene* (3 species), *C. arcuosa*, *Tortrix rusticana*, etc. He calls attention to the fact that the apterous species are usually without a proboscis and that the males very often have highly plumose antennæ.

It seems not improbable that if we knew more fully the oecology of some of these species, about which we are at present ill-informed, we should find that, with possibly some isolated exceptions, there are really only two sections of apterousness in Lepidoptera.

One, that of those species that are dominated by the necessity of laying their eggs in their cocoons or pupa cases, in a way affording them almost absolute protection against enemies, these species become imagines in summer, or at least not in winter. Of these the Psychids are the largest number, in fact, they afford in the Palearctic regions much more than half the number of apterous species, and of the Lepidoptera of the world a probably still more overwhelming proportion. Apterousness of females must not, however, be supposed to have more than a secondary connection with their being case-bearers, since the two other principal members of this section, *Orygias* and *Heterogyndis*, are not case-bearers, and the other case-bearers we know, as *Coleophora*, *Perophora*, *Adela*, etc., show no tendency to apterousness. The main object, at present, in this section would seem to be due protection for the eggs.

The other section would consist typically of our winter moths, of certain alpine species, in which winter conditions largely dominate, and of some African species which emerge when their food-plants are dried up and dead, reproducing, but from a completely opposite cause, the undiscoverable character of the food-plant, the same circumstance that dominates our winter moths and possibly others. In these the dominant condition is to keep the female near the food-plant, or in a habitat very unlikely to be found, if once the female, if winged, got

any, even a short, distance away from it. I have already suggested that some such necessity probably originated the apterousness of the *Psychidae*, the lowest form of which, *Luffias*, *Selenobias*, etc., have restricted and isolated habitats, with perhaps the lichens, etc., on which they feed, rather devoid of any definite odour.

It may be said that with wings these winter moths would reach the food-plant much as they do without them, but if they had wings they would follow the usual habit, lay a few eggs and fly off to another tree, which they would very frequently fail to find, but having no wings they remain on the tree they first found.

The bibliography of these apterous Lepidoptera is very voluminous if we include all systematic works, and I have not explored much of it, and have probably overlooked various papers referring to the special aspect of the question we are considering. I have thought, however, it might be useful to cite certain papers more or less referred to in my remarks, and most of my own notes referring to these groups.

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DISCUSSION.

Mr. A. W. Bacot thought the point of how the wings of insects originated was complementary to the subject. The theory which seemed to him most reasonable was, that insects started as aquatic animals and evolved flight in order that the adult insects might escape enemies in the water and distribute their eggs. Subsequently they assumed the land habit. At the present time insects used their wings chiefly to find food and distribute their eggs; this last function in the lepidoptera seemed the final outcome. Among the insects without wings that he was interested in—blood-suckers—the bugs could afford to lose their wings, because it was no disadvantage to them as the young bugs followed the blood-sucking instincts of the adult. Fleas were restricted to animals with nesting habits or lairs, very largely rodents or birds. What was essential was that the animal should have the homing instinct. For lice to have wings would merely be an encumbrance. As regards the mosquito there was there a very interesting phase. It would be quite satisfactory to the mosquitos, as a race, to be wingless if it were possible to provide for the young, but they returned to the water to breed, and were therefore bound to retain their wings. In the case of the tsetse fly, wings were retained because the animals chiefly attacked afforded no scope for the insect to be purely parasitic, as there was no suitable cover for the larva to pupate in. Another group where the larva was produced full grown, as in the tsetse fly, happened to breed on sheep, and it was quite easy to find a secure position to pupate in the wool without leaving the host. He thought in these cases there was good evidence that the nature of the food and the habits of the larva had to be considered in regard to the retention of wings, when it would otherwise be very profitable to the

insect to lose its wings. With regard to the position of Dr. Chapman concerning the lepidoptera, he entirely agreed that the absence of scent might be the cause of winglessness in desert insects, and possibly in regard to Alpine species, but he did not think that it quite covered the case of *Hiberniae*, which were largely forest living insects. There was no particular scent of tree needed. The insects lived in the forest, and the species of trees on which they fed were a large percentage. He did not think there was a danger of the insects not finding their food plants if they had wings, but that there would be a danger of their being blown out of the wood altogether during storms; because of this risk it was better for them to be without wings, and produce a larger number of eggs. He thought that with the winter moths winglessness was due to the danger of winds blowing the insects away from the woods altogether, and that this was also the case of insects living on oceanic islands.

Mr. A. W. Mera did not think they had come to a definite conclusion that the apterous species had lost their wings or had never gained them. It was difficult to imagine that the females of *Erannis defoliaria* and *Agriopsis marginaria* had lost their wings; they were very energetic females, and it seemed strange that insects with so much vital energy should have lost any gifts that had been bestowed upon them. He was inclined to think that these insects never had wings. The absence of wings might be looked upon as protective, and, as Mr. Bacot had said, there was no reason for them to find their particular tree through scent, for the trees were all round them. The insects would not lay their eggs on a tree that was unsuitable, and they wandered about until they came to a tree with bark that was suitable; they could easily find a suitable tree, particularly the *Hiberniae*, which fed on so many trees. They soon found a suitable crevice on a tree whether they could fly or not. It had always been a wonder to him how some of the insects with wings found their food plant. He mentioned that *Psilura monacha* paired in the day time as well as at night; he was surprised to see this only last year. Winglessness occurred in other groups. One of the micro-lepidoptera, *Chimabache fagella*, was worthy of note because of the way it folded its wings over the body, as if it were becoming coleopterous; he thought the insect looked more like a beetle than a moth.

Mr. B. Cooper thought the argument with regard to scent a very strong one. He did not know whether Dr. Chapman or any member could say what proportion of the insects, like the *Hiberniae* or *Apocheima hispidaria*, appeared before there were any leaves. This would not account for *Orygia antiqua* or *O. gonostigma*.

Mr. A. J. Willsdon said he was inclined to think that these apterous females had sacrificed most of their functions to lay an abundance of eggs. The *Hiberniae* laid a great quantity of ova more than the majority of insects. It was marvellous the ova *Alsophila aescularia* laid. A band of eggs was laid just below the bud of the horse chestnut; there was some scent there, and after the eggs were laid the female seemed to spend most of her body in covering the eggs with hair.

Mr. Mera said he should not give the *Hiberniae* credit for laying more eggs than other genera.

Mr. Bacot said that in some instances, where a large number of eggs were needed, the eggs were decreased in size. An abundance of eggs could be arrived at in another way than by increasing the size of the body, *e.g.*, by increasing the laying period, as with some butterflies. The eggs of *Hiberniae* were not particularly small for the size of the moth, if compared with those of *Amphidaysis betularia* and *A. strataria*.

Mr. F. H. Wolley Dod observed that they must look for a different reason for want of wings in Macro-Psychids to what they did in winter moths.

The President said, the point of the actual loss of wings, that Mr. Mera mentioned, is proved by the pupa case of *Ithysia zozaria*; that both male and female have a place for wings in the pupa cases shows that the female had wings at one time. I think there is no doubt that the females of all these insects were once winged. I do not know if I am right in saying that these wingless females are much more willing to lay their eggs anywhere than other moths. The female of *Pocilopsis lapponaria* is extremely fond of walking up reeds and laying eggs between the inner and outer sheaths; she also walks up telegraph poles and lays eggs in cracks. She does not seem to select by scent, but finds something with a crack in it. Normally the insect lays eggs in the flower head of the cross-leaved heath, which is one of its food plants; the larva will feed on any plant growing on the moor, but usually it feeds on cross-leaved heath and bog-myrtle. On the whole I think these winter wingless species do not choose by scent like some of the summer feeding insects. If wingless they do not wander very far from the food plant, and the little distance they do wander is made up for by the extreme activity of the larva. The larva wanders about the whole day, even when put down by its food plant. How does Dr. Chapman think wings have been lost? Does he think that the female gradually got smaller and smaller wings, or does he think that it occurred suddenly? Various mutations affecting the size and shape of the wings have appeared suddenly in *Drosophila ampelophila*, one of the fruit flies, in the course of Professor Morgan's (1) breeding experiments. In some of these the wings were almost absent, in others rudimentary, truncate or miniature, resembling in fact the various living forms in apterous and semiapterous lepidoptera. These were quite independent of one another, and each was inherited on Mendelian lines. It is true that in all cases both sexes were affected, but other mutations appeared which affected one sex only, the male, and there seems to be no reason why a mutation affecting the size and shape of the wing of the male sex only should not arise in *Drosophila*. Two types of sex inheritance are known, the first in which the female is homozygous for sex and the male heterozygous, the second in which the female is heterozygous and the male homozygous. In the first group sex-limited conditions occur affecting the male only, in the second they affect the female only. Both forms of sex-inheritance are met with in insects. Those flies, bugs, beetles and grasshoppers so far investigated belong to the first group, most butterflies and moths to the second. If apterousness arose as a

sudden mutation we should expect, in cases where one sex alone was apterous, to find it confined to the male sex in the first group and to the female in the second. In lepidoptera no case of winglessness affecting the male alone is known, in Coleoptera there is a genus of beetles with the male alone wingless. These are in favour of the wingless conditions having arisen suddenly, but much more work on heredity in all the genera of the different orders of insects will be necessary before it is possible to say whether my suggestion is likely to prove correct. In any case Dr. Chapman's arguments would hold good as explanations of the reason the mutation was advantageous and therefore perpetuated. It leaves untouched the fundamental problem of how any mutation arises. Before concluding I should like to refer to the experiments of J. Dewitz (2), who claims to have produced wingless specimens of *Polistes* and *Calliphora* by means of cold, and to have produced pupæ of *Euproctis chrysorrhæa* with absence of pigment, and with wing cases reduced in size, by subjecting them to an atmosphere containing hydrocyanic acid. If I follow his argument correctly, he thinks both conditions act alike in reducing the action of oxidases, and thinks that winglessness in nature occurs under conditions in which similar deficiency of oxidase action is likely to occur.

(1) Morgan, *Mechanism of Mendelian Heredity*.

(2) Dewitz, *Zool. Anzeiger*, t. xxv., p. 166.

Arch. p. Anat. u. Physiol.: Physiol. Abt., 1902, p. 61 and p. 339.

Comptes Rendus de l'Acad. des Sciences, 1912, 154, p. 388.

Dr. Chapman, replying to the discussion, said he noted as to insects being blown away from the forest, as Mr. Bacot suggested, if it was possible for them to be blown away, why were not all forest insects apterous and especially the males as being lighter and more at the mercy of the wind? There were a number of storms in summer, though perhaps not such severe ones as in winter. The number of eggs was a point that Professor Poulton had discussed, and suggested that laying a large number of eggs led to winglessness, because the females could not carry them far. His own view was that the insects had not a very large abdomen, but that the absence of wings, with the corresponding absence of thoracic muscles, made the abdomen look large in comparison with the slender thorax. As to the apterous condition arising from mutation, he did not think they had met with a moth that had lost all its wings by mutation; they had instances of a moth having lost one wing, but he thought that was due to injury rather than anything else. He did not bring forward want of scent except to explain the case of the winter moths; the summer moths that were apterous practically all lay their eggs on the cocoons, and an entirely different set of circumstances led to them being apterous. The case of *Poecilopsis lapponaria* seemed to come into line with the desert moths. The eggs were laid in the area of its food plants; it did not matter where they were laid as long as it was out of the way of its enemies and of the damp. The other winter moths might be guided to some extent by similar circumstances, as their larvæ could eat many shrubs and trees.

ASPECTS OF BIRD LIFE IN EUROPE.

(Read November 21st, by J. A. SIMES.)

These notes are offered—with much diffidence—at the urgent request of the Ornithological Committee, the war having thinned the ranks of their competent ornithologists to such an extent that they must needs have recourse to the incompetent. I wish you to regard them as a sort of Ornithological “Kriegsbrod,”—a medley which, like other varieties of “Kriegsbrod,” will leave you under no misapprehension as to the effect of the “Krieg” factor, but wondering how and why the term “brod” has crept in.

The first impression left on the mind of an observer of British birds, after he has extended his wanderings into other countries, is the wonderful richness, both in species and individuals, of the British bird fauna, and the great distances which must be traversed on the Continent before any really striking new forms are met with; while even in the case of those new forms, the species as often as not is one which is not wholly unknown in Britain. Thus I did not see my first golden oriole or hoopoe until I reached the French Mediterranean coast, my first vulture until I reached Central Spain, while I had to go as far afield as the coast of Albania to make the acquaintance of the bee eater (*Merops apiaster*). But in none of these areas is bird life so ever-present as it is at home. Take a short country walk in almost any part of England, and at any season of the year, and you are certain to meet with scores upon scores of individuals belonging to, perhaps, two dozen species. I know personally of no area where I have travelled on the continent—unless it be, perhaps, the agricultural and wooded departments of Eastern France—where you could count on finding so many species in a small area; you would certainly not find anything like so many individuals. I am aware, of course, that there are areas, such as the Coto Doñana at the mouth of the Guadalquivir, the shores of the White Sea, the Dobrudscha or Delta of the Danube, and so forth, where, at certain periods of the year, the profusion of bird life is almost incredible; but I am here speaking of average distribution over a whole country throughout the year. There can be no doubt, then, that the United Kingdom must be regarded as an exceptionally favourable region for the development of bird life, and one is tempted to enquire what are the conditions which make it so. First and foremost, I suppose, we must place the British climate, which, however depressing to the human inhabitants of these islands, is to the birds a source of strength. It is never very hot or very cold for long periods at a time. A few weeks without rain are so remarkable that we begin talking of the great drought. Compare this with the conditions obtaining in Central Europe, where winter is often unbroken for four or five months on end, frost supervening on frost over a landscape buried deep in snow. And then when the thaw comes the transition to summer conditions is very rapid; and great

heat and dust often prevail for weeks without rain. One need scarcely enlarge on the disadvantage of these conditions to birds, which find their subsistence in slugs, snails, worms, beetles, and such like small game of the soil. Again, considering their small area, the British Islands offer almost every kind of country for the delectation of various types of bird life. There is a coast line to serve as an ideal base for pelagic birds, with numerous sheltered estuaries for such marine species as are too timid to face the open seas; there are sequestered and bleak mountains, sheltered valleys, moorlands, slow-moving rivers, upland commons and downs, arable land and vast pastures, as well as extensive stretches of forest and woodland. Of typical and natural marsh country, such as exists, say, in Roumania and Russia, there is comparatively little and likely to be less; and though this fact deprives us perhaps of certain kinds of birds which we might otherwise have seen more frequently, the condition is one which must be expected to arise in a densely populated land like ours. And the deficiency is offset by advantages in other directions. In few countries of the size of ours is there such a vast area of permanent pasture to serve as a happy hunting ground for pipits, larks, starlings, rooks and numbers of other birds; while another British institution, to be met with in juxtaposition to the permanent pasture, is of great value to birds as affording them ready cover, and also as ensuring them an abundant food supply throughout the year—I mean the quick set hedge, which nowhere thrives better than it does with us; indeed, there are few countries where it is to be found at all. In spring, summer and autumn the hedgerows of Britain form an inexhaustible larder of insect life for such species as need such a pabulum; while during the winter the berries of the whitethorn and of the many other bushes which thrive under its fostering care, form the bulk of the food supply for our resident species and the large number of immigrants from overseas.

Our pasturage system, too, is different from our neighbours'. In England, cattle, horses and sheep roam the fields almost everywhere; but on the continent generally they are stall-fed and the fields are deserted. You may travel scores of miles through France, Germany, Belgium or Switzerland, and never see a beast in the fields. Now there can be no doubt that wherever there are cattle abroad there also are Diptera and Coleoptera in attendance upon them or hovering about their droppings; and this spreads insect life of the types mentioned over a wide area and ensures it a rapid and vast multiplication to the profit of bird life, if to the inconvenience of the human species. That this is no armchair theory a single instance will suffice to prove. Any butterfly collector who has worked, say, the New Forest or the Fens, knows the perpetual worry he has suffered from *Tabanidae* and other Diptera. At Brindisi, where I have worked in blazing sunshine, spring, summer and autumn, I do not think I have once been troubled with flies.

There is one more feature of this country which has an important bearing on the general distribution of about a score of species of birds, and that is the fondness of our people for living in the country. Go

where you will in most districts of England and Wales, and you will never be far from an inhabited house or cottage. Every mile or so along our country roads you will come across a cottage or two, an inn at an isolated farm—at all of which human beings are permanently resident. The human habitation, with its garden and fruit trees, its supply of animal and vegetable refuse, and its cultivators who are continually breaking up its soil, is almost everywhere the nucleus of a restricted bird colony. The sparrow and starling are sure to be in attendance; and so are the robin, hedge sparrow, two or three tit-mice, jackdaw, rook, blackbird, missel thrush, song thrush, wren, one or two warblers, a skylark or pipit, as well as the house martin and swallow. Human habitations and their surroundings are, moreover, attractive to a number of species of wild birds which are usually considered to be averse from the human environment. Such species, it is true, do not hover about the precincts of man's abode in the broad light of day; but they regularly visit them immediately after dawn. Birds have long since discovered that humanity does not rise at dawn in summer months and that his gardens and plantations may be visited at that hour with impunity. I have had occasion from time to time to work in my garden or, at any rate, to go into it as soon as it was light, and I have been surprised to see there such birds as jays, rooks, wood pigeons, partridges, tawny owls, green woodpeckers and spotted woodpeckers. The lesser spotted woodpecker is a very frequent visitor to my garden at such a time and I have come to the conclusion that it is by no means an uncommon bird, although it is so rarely seen in the ordinary way. On the continent generally the position is different. People do not live in the country in the same way. Humanity is centred in towns and villages; it goes forth in the morning to work in the fields and returns to the town or village at night. The villages, of course, act as centres of bird life; but there are great tracts of intervening country in which no human residence is to be found; and consequently the bird life, which loves the vicinity of a human abode, is not nearly so widely and so generally spread, nor is it in the aggregate so abundant.

I have already alluded to the variability of the climate of these islands as compared with the more stable conditions of the continental land area; and what is true in that connection is also true as between different parts of the United Kingdom. Wind and rain in one district do not preclude the possibility of some sunshine or fair weather in an adjoining area; and a spell of frost which may harden the ground and freeze up small streams in an upland district may prove impotent to bind land, or water in a more sheltered region a few miles away. These variations have an important bearing on our bird life; and there can be little doubt that such mobile organisms take full advantage of their mobility to forsake temporarily an unfavourable area for a region where the conditions of life are easier. I opine, therefore, that outside the breeding season, when they are tied down to their nesting localities, there are few birds which can be regarded as really resident in any area. My own observations tend to show, that with the possible exception of the house sparrow, the bird

life of a particular district is in a constant state of flux. Normally, the movements are on a small scale, but a short spell of really unfavourable weather is sufficient to bring about big movements in the ranks of many species that are usually regarded as resident; and I feel sure that in the case of many recognised migrants ebb and flow do not always take place only once in the year. It frequently happens, for example, that swallows and swifts are greeted with really cold and deplorable weather soon after their arrival here and that they wholly disappear for a time. What happens to them? They cannot lie up for a day or two; that would mean starvation. The only feasible hypothesis to my mind is that they fall back again until they encounter suitable conditions, whether that involves a journey to our own South Coast or to Central or Southern France. Such a retreat is not a very serious undertaking to species of such powers of flight as the swallows and swifts. All their food is obtained on the wing, and if through stress of weather one hunting ground is drawn blank, there cannot be a shadow of doubt that they betake themselves to another, whether it be near or far. Ready mobility seems to be an essential condition to the welfare of any species which lives entirely or mainly on prey caught on the wing. It is not so imperative in the case of species which find their subsistence on insects attached to trees and so forth which must always remain on or near their particular food plant. Weather may, of course, affect the accessibility of such insect food and might even render a favourite kind of food unobtainable in a given district for the time being, and therefore birds which needed a particular kind of food would be driven to seek it further afield than usual and might even have to traverse considerable distances to obtain it. As an illustration of what birds can and will do in such circumstances, I would refer to an amazing case vouched for by Messrs. Abel and Chapman, the joint authors of two big volumes on the wild life of Spain. Referring to a shooting expedition carried out by them at Lake Daimiel, in the province of La Mancha, they say, "Another fact that well nigh struck dumb the authors—long accustomed to study and preach the incredible mobility of bird life—was that ducks shot at dawn at Daimiel are found to be cropful of *rice*. Now the nearest rice grounds are at Valencia, distant more than 180 miles; hence these ducks, not as a migratory effort, but merely as incidental to each night's food supply, have sped at least 360 miles between dusk and dawn." When one considers how few are the days during the year when some district or the other of the United Kingdom is not unpleasant through stress of weather, some conception may be formed of the value of the mobility to birds and of the extent to which it must necessarily be turned to account. What is wanted in this connection is a mass of detailed observation of bird movements; and probably that can be best obtained by ringing birds on a large scale; but to enable us to take a comprehensive view of the whole situation it would also be necessary to have detailed meteorological reports as well as agricultural reports from all over the country. There is therefore in this connection heaps of work still to be done by latter day disciples of Gilbert White of Selborne. Indeed, I would suggest still another

direction in which bird lovers with leisure could perform work of real value from a scientific point of view, and that is by carrying out careful observation on what birds eat. I am, of course, aware that much has been done in this direction already and that we have travelled far from the time when the food of 90 per cent. of our birds was given in the text books as "worms, insects, seeds, etc."; but I suggest that still more detailed information is desirable. In particular, we want data of what particular species of birds eat at different times of the year and in all weathers. We want precise details of what a species eats, not only during a period of normal and average weather, but also of the extremes of variation in the matter of food brought about by extremes in the matter of meteorological conditions, whether they take the form of excessive heat, cold, wind, rain, snow, and so forth; further we want to know on what it subsists during the nesting season, what it consumes during the period of moulting, and finally, what it eats when, released from family and marriage ties, it battles as an isolated unit in the struggle for existence. If we could obtain detailed observations on a large number of individuals and species over a long period, I think we should be amazed at the wide range of foods affected by birds that are regarded either as wholly insectivorous or wholly graminivorous, and even by birds that are well known to be general feeders. The food is very largely a mere matter of what is available for the time being and what is most palatable or of the greatest food value out of the available supply. When the cherries are ripe, the jays, blackbirds, starlings, tits, and even a few warblers, have little thought for insects, slugs, snails, or wild fruits of the country side; when the cherries and other soft fruits have gone there are the mountain ash berries and the elder berries; and these are attacked with an avidity which seems to suggest that the birds are determined to have the full benefit of their choicest home crops before the horde of alien immigrants—redwings, fieldfares, and starlings—descend on the country side. When the latter arrive there is generally nothing left save the less succulent berries, such as hawthorn, rose, holly, and so forth. Here one sees clearly a marked preference. If cherries and mountain ash berries lasted all the year round it is probable that hawthorn berries would rarely be touched; but as it is the latter are the staff of life for numbers of birds throughout the winter and early spring. They are so abundant that they are rarely all consumed, and there usually remain plenty on the bushes long after the succeeding spring has clothed the latter in leaf and blossom once more. Even then a cold snap may send many birds back to them. An instance of what stress of weather can do in the matter of birds' diet came under my notice last spring. Early in April most of the birds had begun to think of spring—of nests and of new diet. The blackbirds and thrushes were forsaking the gardens for the woods, the robins had already begun to build, and the titmice had marked out their nesting sites in holes of trees and in lamp posts and were searching the tree buds for the earliest geometrid larvæ. Then came a sharp change. Snow fell to the depth of several inches; the trees, bushes and ground were covered and matters were made worse by

frost. Back came the birds to the gardens and vicinities of human dwellings. The tits were so hard put to it that they would eat almost anything. I watched them repeatedly hanging back downwards on the hawthorn bushes paring off the under portions of hawthorn berries, the upper parts being unavailable through the incrustation of snow. They searched all the crevices of windows, doors, fences, outhouses, tore to pieces the horrid silky egg cases of spiders to get at the eggs, and raked over dead leaves and soil in spots that had escaped the snow. In the course of those hours of stress pupae of *Pieris brassicae* and *P. rapae*, which had passed the winter safely, were picked to pieces—an interesting detail, because I have always regarded these as somewhat distasteful. One can imagine from this what the effect of a hard and prolonged winter might be. We should have vastly more immigrants who would scour our hedges and coppices, eating up all the hawthorn and rose berries, till nothing remained but such berries as those of the bitter sweet and deadly nightshade; starvation would be facing many a fieldfare and redwing, and who can doubt that here and there, under stress of hunger, a famished bird would be driven to swallow a berry of the deadly *Belladonna*, with the result that its emaciated body would ere long furnish the necessary fertilising medium for the birth of a new plant of the fatal *Atropa*.

What we want then is such a series of observations as would enable us to construct a food curve for each species, covering its diet from infancy to age, in times of abundance and times of dearth; and the nearer we can approach to that ideal the greater will be the light shed on the still vexed problem of the relationship between birds and insects, and particularly the Lepidoptera. Perhaps I need hardly tell this audience that during the last few years there have not been wanting naturalists who were disposed to doubt the validity of the theory that the cryptic colours of insects, and particularly of butterflies, have been evolved by natural selection, as the result of birds and other creatures catching and devouring the less protected forms. The ground on which the Darwinian theory was attacked was generally, I believe, that there was practically no evidence that birds did actually attack butterflies. The defenders of the theory were forced to admit that the actual records of such attacks were few and far between, and appeal was made for careful observation in this matter. The appeal did not produce any very tangible results so far as Europe was concerned; but ample confirmation of the general theory has been obtained as the result of careful observation, over a number of years, by Mr. Swynnerton, in Central Africa. Mr. Swynnerton was able to prove conclusively that in that area butterflies are regularly attacked by birds, both on the wing and when alighted for drinking purposes. Further, he showed that the "nauseousness" of species with warning colours is purely relative; and that just as birds are driven by hunger to eat the less palatable berries, so similar stress may, and does, lead them to eat more and more nauseous insects. The advantage that an insect derives from being nauseous is not, therefore, complete immunity from bird attack, but immunity so long as other kinds of insects are obtainable. That this is a very considerable advantage may

be inferred from the number of wholly palatable species which mimic the less palatable, in the hope of sharing in the comparative immunity.

Now why could we not obtain in Europe the evidence which Mr. Swynnerton eventually got from Central Africa? May I suggest that we were looking for something in Europe which is very little known there, namely, attacks by birds on flying butterflies. With few exceptions the birds of Europe are not adapted to catching butterflies or day-flying Lepidoptera on the wing. A few cases have been recorded, but there is reason to think that in many of these the birds concerned were young and inexperienced individuals, with more energy than sense; while in the other cases the butterflies afforded exceptional opportunities to the bird, whose necessities were also exceptional. In most cases the butterflies eluded the pursuer and continued their undulating and unsteady courses without the slightest perturbation. So far as Europe is concerned the toll levied on the Lepidoptera by the birds is levied on the immature—ova, larvæ, and pupæ—and on individuals discovered at rest. So far as the species which feed on grasses and low plants are concerned the birds responsible are for the most part wagtails, larks, pipits, wheatears, starlings, rooks, partridges and pheasants (I may say that I consider the pheasant the great enemy of *Parage ageria*); and in the case of bush and shrub feeding species the smaller perching birds—robins, chats, buntings, finches, titmice, and above all, perhaps, during certain months, the warblers—are the culprits. The titmice are with us all the year round, and perhaps in the aggregate their effect on insect life is the greatest; but the warblers have long impressed me as a very deadly family of birds. They are at work incessantly from dawn to dusk, restlessly examining bushes and shrubs for insects. To gain an adequate impression of their work, which is often performed in silence, you must lie down in their haunts and keep quite still, and before long you will become aware of numbers of birds unceasingly moving from branch to branch—never flying far and rarely breaking cover. Amongst the southern forms this mouse-like habit is even more marked; and unless you take such precautions as I have suggested you may pass through the chosen haunts of such birds as the Dartford, the Sardinian, and the Icterine warblers, and never see a bird. In France, in Italy, and in Spain, I have watched them by the hour together, and I am convinced that their effect on insect life is enormous. The true warblers are distributed all over Europe and over Asia, as far as Turkestan and the great Indian mountain chains; but they do not cross the mountains and penetrate into India. Indeed they are absent from tropical areas generally, and I am personally of opinion that this is due less to their physical constitutions, or to their powers of surmounting geographical barriers, than to their specialised habits. In India, there is one great and ever-present menace to bird life generally—a menace which has been infinitely potent in its effect on the habits of the birds of the peninsula—I mean the vast abundance of snakes of all sorts and sizes. It is scarcely too much to say that if Indian birds have one pre-occupation in life it is connected with the problem of how to evade the snake peril. It is for that reason that so many species choose the

thorniest of thorny bushes for their nests, for that reason that others nest in vast colonies which present a common front to the enemy, that others make long and purse-like nests with elusive entrances, while still others nest in holes in trees, which they wall up to make the entrance as inconspicuous as possible; while one species—a woodpecker—never feels secure against the enemy unless he has been able to hollow out for his family a hole in the middle of a nest of the most venomous species of tree ant. An obnoxious secretion of the bird's skin suffices to keep the ants at bay, and on the other hand *they* can be trusted to deal with any thinly scaled tree snake that ventures within their sphere of action. The tree snakes are everywhere and of all colours, their tints harmonizing with the stems and leaves of the shrubs amongst which they seek their prey. Agile, bold, and of a strength which is not suggested by their size, they are perpetually on the look-out for small birds which are sufficiently unwary to alight within their radius of action. What a time they would have with birds of such habits as the true warblers! In their place one meets with species that hunt their prey on the wing, such as drongos, bulbuls, shrikes, wood shrikes, tyrant flycatchers, etc.; and it seems to me to be possibly in the nature of cause and effect that one finds in such a snake-frequented territory a scarcity of what one may term the searching birds, and the multiplication of species that seek their prey flying. The altered conditions of life could not fail to have their effect on the insects, and we find amongst the Indian butterflies characteristics which are not disclosed in more temperate regions. For instance, no European butterfly that was attacked by a bird would seek to elude capture by flying to cover and trusting to its resemblance to its surroundings to elude the enemy. Yet we have the testimony of Oriental naturalists that this is the regular habit of the various genera of leaf butterflies, such as *Kallima*, *Melanitis*, etc. This habit seems to betoken a long continued campaign on the part of birds against the flying butterflies. Another fact, pointing in the same direction, is the large number of species and genera which frequent the edges and openings of woods and forests and are characterised with that black and white colouration so calculated to baulk an enemy—the colouration being such that, as the insect flits in and out amongst the trees it is a matter of very great difficulty to follow it. The difficulty is enhanced when, to the black and white colouration, is superadded iridescence, such as is found in *Apatura*. And once again, may we not ascribe in large measure to the pursuit of the flying insects by birds the phenomenon of Müllerian mimicry—the development of large groups or associations of insects of diverse species, genera, and families, all possessing a common scheme of colouration, the tone being set by a nucleus of two or three nauseous species. I suggest, then, for your consideration, that the phenomenon of Müllerian mimicry may have come into existence through the attacks of birds on flying butterflies, and that this method of securing prey, rather than by searching for the resting insects, as the practice is in other areas, may have been dictated in some regions by the fear on the part of birds of the tree snakes which infest the foliage of trees and shrubs. At any rate, the phenomenon

is found both in India and tropical South America, where tree snakes abound; but it is also found to a marked degree in Central Africa, and though there are undoubtedly tree snakes there (*e.g.*, the *Mambas*) I fear that my knowledge is not sufficiently extensive to permit me to say whether such snakes abound in that region also. It is significant, I think, that amongst those groups of insects which in Europe are pursued on the wing by birds—Diptera, Hymenoptera, and Coleoptera—the phenomenon is again to be remarked—Diptera and Coleoptera being often got up on a general plan to suggest that they are Hymenoptera possessed of deadly stings. It seems obvious that the advantages of belonging to a Müllerian group must be most accentuated when the enemy attacks on the wing, and is therefore not able to obtain a close view of its quarry; it would seem to follow that anything which impelled more kinds of birds to adopt this habit would serve to increase the tendency to Müllerian mimicry; and I suggest that in certain tropical areas the stimulus has been the fear of tree snakes. I am not aware that this view has been expressed before, and I shall await your comments on the suggestion with interest.

Even in Europe snakes are no small menace to birds, and in certain areas they take quite a considerable toll of eggs and nestlings; but it is for the most part ground-building species that suffer. Probably they, in conjunction with other ground enemies such as rats and weasels, have played a conspicuous part in modifying the habits of young birds. For instance it is in my experience a common feature in the young of ground building birds that have to remain in their nests for a considerable period to refrain from evincing the noisy and clamorous desire for food that young thrushes and blackbirds are wont to evince. The young of robins, for example, are very careful not to move or open their cavernous bills until it is abundantly clear that the disturbing element making itself felt in the vicinity of the nest is in very truth the parent bird. As one gets further south—into the area of distribution of the European rat snake which climbs bushes—the phenomenon spreads, and it is met with amongst several bush building species; but my experience of nestlings, both at home and abroad, is not sufficiently extensive to permit me to suggest how far the habit obtains as a general rule. Perhaps the ornithologists present will be good enough to give me the benefit of their experience on these points in the discussion which follows these notes.

When I was asked by the Ornithological Research Committee to fill the bill on this occasion, it was suggested to me that the Society would like to know what differences of habit I had detected in foreign countries on the part of birds which also frequent the British Isles. I fear that I have little material from which to comply with such a request. There must, of course, be numerous changes of practice, as for example when our common chaffinch builds his nest in the foot of the spathe of a date palm on the Riviera, or the wren uses a dried and curled up frond of the aloe in which to construct his home of moss and fibre; but these are merely cases of making use of local material to carry out an immutable purpose. There are, however, a few points in this connection which might prove of interest. Whenever I see the

swift over here I cannot help feeling that his spirit is not the same as when he is met with in sunnier lands further south ; his speed always strikes me as being appreciably less and his agility far less wonderful. It may be fancy on my part, but it seems to me that the bird is handicapped by our moister and denser air, and by the fact that his blood is rarely heated in his veins in England as it is in Italy or North Africa. In Italy, under the blazing sun, his speed and agility are marvellous : and one of the memories which I shall ever retain of my visits to such baking towns as Bari, Foggia, Taranto and Brindisi, will be of companies of swifts, 50 to 100 strong, sweeping up and down the streets and round the spires, screaming incessantly as they wheel hither and thither. The speed is bewildering, and one can readily understand how easy it would be for such a bird to leave Europe behind at sunrise and roost the same night in a remote village in Central Africa.

The martins never reach such a speed and do not require heat in the same way as the swift. The crag martin is, I think, the wilder of the European species, and I am not aware of its ever making its nest on a human dwelling, as does the house martin. The latter, however, does not by any means always nest on a house. I have seen its nest on a cliff side at Bourg St. Maurice, in the Rhone Valley, in Switzerland, and also in the Sierras in Spain ; but it seems to prefer human dwellings as a rule. Possibly the attraction is the overhanging roof of human dwellings that gives shelter from the weather, and the fact that where there are humans there are cattle, and where there are cattle there are flies.

The black redstart is a species which, on the Continent, seems to prefer the neighbourhood of houses and chalets for pretty much the same reason as the house martin. It is not often observed in England, and so far as it is seen its appearance here is rather remarkable, for it usually comes as a winter migrant from Central Europe to winter on our Devonshire coast—a phenomenon which, so far as I know, is without parallel in the annals of our bird life. Its affinity with the chats generally is proclaimed at once by its penchant for getting on the house or barn or hayrick which it frequents and there giving forth its pleasant little song.

There is a point on which I should like to hear the views of ornithologists, and that is, as to the persistence of the red crown in so many species of woodpecker—both *Geococcyx* and *Picus*—British and foreign. What is the meaning and object of the red crown in this group ? One would imagine from its persistence in so many species that it has some considerable significance. Is it a recognition mark or is it a danger signal to warn other birds against interference with or trespass on the preserves of these rather bad tempered and formidably armed birds ? And are there any European species belonging to this group which secrete noxious body lymphs with which to keep at bay irate insects, such as wasps or bees ? The secretion is found in two or three foreign species in widely separated areas, and one would imagine that it would be an advantage to some at any rate of the European forms. The woodpeckers are a group of birds that it is

very difficult to study closely. They are of wide distribution, but I have never found them to be abundant in any area, and I do not think that they have forced themselves more on my notice during my Continental rambles than they do at home. Probably the mode of life is such that each pair of birds needs quite a considerable tract of woodland for its support; and the tenants of a particular forest tract are careful to see to it that no trespassers are tolerated in their domain. This is a habit which is found in many widely separated groups. The golden oriole, for example, in Europe is one of the most determined believers in the sacred rights of landed property; and a trespasser gets a hot time if he ventures to cross the boundary line of a neighbour's domain. The oriole is a noisy bird, with a raucous and unmistakable voice, which, in conjunction with his flaring colours, most certainly tend to prevent anything in the nature of stealthy poaching. The king crows or drongos of India have this habit much more pronounced, with the result that they are regarded by Anglo-Indians as the most quarrelsome and pugnacious of birds; but strangely enough, in India the golden oriole at many seasons of the year is actually gregarious, especially when the fruit of the banyan tree is ripe—a time when the Indian ornithologist must enjoy himself immensely, for the trees are said to be often covered with orioles, as well as hosts of other birds of widely different genera.

Perhaps there is nothing so calculated to make an ornithologist hesitate to dogmatise as to what constitutes a species than to ramble through diverse foreign countries, where he will meet with birds strangely reminiscent of those at home, but differing in certain quite perceptible particulars. Ornithologists as a class have, I fear, much too rigid views on what are and what are not distinct species, and I cannot help thinking that in many cases specific rank has been accorded to birds on the basis of slight divergences of plumage and habit which are not based on any structural characters. When I was in Spain I remarked on the great numbers of a wheatear which I took to be our ordinary species (*Enanthe oenanthe*), and was much struck with the variations in colour to be met with. I am told that the bird I found is Dresser's russet wheatear, which has been described as specifically distinct, mainly, I gather, on the basis of the general russet tinting of those parts of the body which in our birds are grey or white. Now I cannot believe that this matter of coloration is in itself sufficient to separate a bird which, in habits and size, is identical with *Enanthe oenanthe*, and I suggest that at most it is a geographical form, sufficiently well differentiated to be accorded a separate name, albeit it does not differ from its relative to anything like the same degree as do the Spanish races of certain Lycaenid butterflies from their type forms. The Spanish sparrow is another case in point, and suggests that some closer study and clearer insight is necessary to enable ornithologists to arrive at a somewhat more scientific view as to what should be held to constitute a species. Already a more enlightened view prevails in connection with certain groups that have been well studied, and the time has gone by when the forms of the jackdaw which possess a grey hood and mantle were separated from

the form which is uniformly black. Indeed, in this familiar group there have been bold spirits at work who do not hesitate to declare that the carrion crow and the hoodie are co-specific, the latter being at best a geographical form of the former—a view which, even if it is difficult to believe, is at least a healthy sign of the times, and encourages us to look forward with hope to a well-considered revision of the ten species of jay into which the Palearctic genus *Garrulus* has been divided. Many of these forms are very closely related and I cannot but feel that it only needs some research by a competent ornithologist to sort out this genus in such a way that the problems which it presents to the student of geographical distribution would speedily disappear. Spain, for some reason or another, is rich in species which are of great interest from the point of view of distribution. There is a Spanish magpie—the azure winged—a species which I only saw in captivity at Valencia, which has the most amazing distribution found amongst the Corvidæ. It is very rare and of very limited range, even in Spain, and its nearest relative is found no nearer than China and Japan. After this anything is possible in the Corvidæ; and we read without surprise that the chough of our Western Coasts, which rarely strays far from the sea or from sea level, is to be met with unchanged at Ladak, in Western Thibet, at an altitude, say, of some 13,000 feet.

I had, too, a good deal of opportunity in the course of my wanderings to study the common magpie, which in most favourable areas is vastly more abundant than in Britain, but my eye has not been able to detect any difference in form and habits in any of its areas. Its flight is very much like that of the jay, and nothing like so easy or smooth as most of the Corvidæ. Indeed the two birds mentioned always seem to me to have inadequate wings, with the result that it is a struggle to keep going, and they seem as if they are doubtful when they embark on a flight of a hundred yards or so whether they will be able to keep it up till they reach their objective. Of the other Corvidæ, and especially the rook, one sees little in the parts I have visited, and I have no notes of interest in regard to them.

The starling is also a bird which is conspicuously scarce in my experience outside England, and I have had no opportunity of judging by observation in other areas the validity of the division of the starling into two species, the intermediate and the common. I am not convinced that they are distinct; indeed, I carry my suspicions further, and I am wondering whether the black starling of Spain is not merely an archaic form of our bird that has never developed the characteristic spotting. It is significant, I think, that the young birds of the common starling in their first plumage show no spots, but are of a unicolorous form, not vastly lighter in tint than the Spanish black starling. The latter is very rare and of very restricted distribution—facts which also suggest that it is an archaic form.

But enough of this discursive chatter—one might rattle on with views and surmises for hours and be little “forrarder” at the end of it all. I warned you in advance that if you expected ornithological lore from me you were going to have a very poor time; the best I can hope is that, unknowingly, I may have opened up some avenue of

speculation which will lead to the really important part of the evening, and that is a vigorous discussion.

Commenting on the paper the President said that the adequate study of the food of birds, not only at one particular time but at all times of the year, would solve many entomological problems, and in that way also many botanical problems would be elucidated. He asked what positive evidence Mr. Simes had that pheasants were the great enemy of *Pararge aegeria*.

Mr. W. E. Glegg said that, apparently, Mr. Simes' opinion was that, on the Continent, there was a greater number of species of birds than in Britain, but that in Britain they found a greater number of individuals; it seemed to him that the protection afforded to birds here must be largely the reason for that. Though the number of species in Britain was decreasing, the number of individuals was increasing rapidly; he thought that was generally admitted, and the main factor was protection. He had seen birds catching butterflies in this country. He saw an adult spotted flycatcher taking butterflies in Epping Forest, and had seen warblers do it. He had found the martin nesting on the cliffs on the East Coast of Scotland in preference to houses.

Mr. A. W. Mera questioned whether the disappearance of *P. aegeria* was due to the pheasant, and said that the wall butterfly, *P. megaera*, was disappearing quite as rapidly as the woodland species.

Mr. Hanson said he had known the house martin nesting on the roof of caves, but not on the face of cliffs.

Mr. Hall suggested that the migration of birds might occur at the time when the seeds on which they fed were ripe. With regard to snakes in tropical forests, he thought Mr. Simes had brought forward a new and possibly a valuable contribution to our ideas on the subject. He asked if Mr. Simes thought that leeches and spiders might work to the same end.

Mr. Austin, in regard to the investigation of the food of birds, emphasized the necessity for examination of the stomach contents. He asked if the red crest of the woodpecker might not be a warning. With regard to the increase of the starling in Britain it seemed strange that the increase was confined to our island. He did not consider that our bird population had much to fear from snakes.

Mr. Woolley Dod thought that the preference of martins for cliffs sometimes might be caused by their finding it easier to get the mud to stick to the cliffs; because of the nature of the mud it sometimes did not stick well.

Mr. Simes said, in reply to remarks made, that he had no very positive data that pheasants were the enemies of *P. aegeria*; he had long been desirous of finding the culprit, and it struck him that a consideration of all the facts and especially the localities that *P. aegeria* haunted was enough to convict the pheasant out of hand; he thought it most unlikely that the larvæ would escape such an omnivorous feeder. With regard to *P. megaera*, he was inclined to implicate the partridge. He pointed out that the insect was not a frequenter of

walls of houses or gardens, as Mr. Mera implied, but of sunny banks in the open country side; and its disappearance in some districts he attributed to the undue preservation of the partridge. It was well-known that the spotted flycatcher as a species would attack any kind of flying insect; and many of the warblers would; these were, however, in all probability cases of special opportunity. With regard to the nesting of the house martin, he would not attempt to theorise without seeing the locality; the reason might be that the sites presented by human habitations were not suitable.

Mr. Hall's suggestion that migration occurred when seeds were ripe was new to him, and so far as his experience went he was unable to confirm or disprove it. He thought it quite conceivable that leeches and spiders in tropical forests might sometimes act in the same way as snakes in warning birds off trees, but he thought they were just as likely to act in the opposite direction by providing a food supply for them. He added, with reference to Mr. Glegg's remarks, that area for area, bird life in England always appeared to him to be more abundant as regards species and individuals than in any country he had visited.

ANNUAL REPORT ON THE BIRDS OF EPPING FOREST FOR THE YEAR 1916.

INTRODUCTION.

The Ornithological Committee presents the first of what it is hoped will be an Annual Report on the birds of Epping Forest.

The term Epping Forest is intended to indicate all that land which is under the control of the Corporation of the City of London.

The annual period will commence on 1st January and close on 31st December.

The topographical nomenclature is that of Mr. E. N. Buxton's Guide. In one instance a name has been created, the open ground, on which stands the site of the old High Beach Church, is described herein as Old Church Plain, and in the future it may be necessary to designate further unnamed ground.

Apart from the list given by Mr. E. N. Buxton in his unique guide no other record of the avifauna of this area seems to exist, and this list, which in the first instance does not confine itself strictly to Epping Forest and again quotes many vague records, is now old.

To-day naturalists throughout the world are convinced that the formation of natural reserves is essential if many species of our flora and fauna are to be retained. In Epping Forest we have the material at hand. The Act of 1878 provides "that the Conservators shall at all times, as far as possible, preserve the natural aspect of the forest."

Again, Mr. Buxton, in his guide, refers to "the preservation of all the wild life which finds a home in the 'waste.'" It is therefore clear that the intention of those who were responsible for the acquisition of Epping Forest as public land, although they may not have had the naturalist's conception of a natural reserve, was that it should afford sanctuary to wild life. The question arises as to whether or not the birds of the Forest are maintaining their status, still further, even if they are, whether it is not possible to increase the avifauna of the some 6,000 acres comprised in the area. In answering such questions the Committee feels that such a report as this would be indispensable.

It is hardly necessary to point out the value and interest this report would have for local naturalists, and in time it would have ecological value.

The records here presented are the results of the observations of a few members of the Society, and the Committee is fully alive to their inadequacy as constituting a survey of the selected district. It is hoped that this first contribution will serve as a call not only to all the observers of the society but particularly to all ornithologists working in Epping Forest.

From Chingford, which is the most convenient step off for those who have contributed to the diary, northwards to Woodricken Hill on the west and Jack's Hill on the east, the ground has been well covered. Occasional records are available for most of the Forest, but none are forthcoming from Lord's Bushes. Regular recorders are required for the ground stretching northwards from Wanstead Flats to Chingford, and again from Theydon Bois to the Lower Forest. At the same time records are invited from all parts.

Conspicuous absentees from the diary are the nocturnal species, with the exception of the nightjar, and records of these are specially requested.

By the courtesy of Mr. F. F. McKenzie, Superintendent of the Forest, a report on the Wanstead Park Heronry is included, and it is hoped this will be furnished annually.

At this preliminary stage it would be unwise to draw deductions, but it is felt that the records confirm Mr. E. N. Buxton's opinion of the jay, and it is hoped that if "the solemn order which went forth from the Guildhall, that the numbers are to be limited," has fallen into abeyance, it will be revived.

Finally, an appeal is made for communications which have any bearing on the birds, common as well as rare, of Epping Forest.

January 9th.—39 Tufted Ducks and 1 Kingfisher, Connaught Water.

January 16th.—50 Tufted Ducks on Connaught Water. This is the largest flock we have record of on the lake. The Green Woodpecker and Kingfisher also identified here. Two female Bullfinches, Strawberry Hill, Large flocks of Lesser Redpolls at High Beach. These birds were feeding on the ground, previously they had confined themselves to the higher branches of the birches.

January 30th.—Tufted Ducks were again on Connaught Water,

accompanied by a solitary Coot. A Golden-crested Wren was seen here. On High Beach the Lesser Redpolls had shifted their feeding ground, possibly having exhausted the food supply where previously seen. The flock probably ran into hundreds. The Nuthatch was also heard and seen here.

February 6th.—Some Tufted Ducks and the solitary Coot was on Connaught Water. Here Chaffinches were heard singing for the first time this season, and the Green Woodpecker was seen and heard. Two Golden-crested Wrens were seen in Little Monk Wood. In Great Monk Wood an unusually large flock of Chaffinches, Titmice, etc., was observed. At Fairmead the Green Woodpecker was again seen. The five Titmice which are found in the Forest, namely, Blue, Great, Marsh, Coal, and Long-tailed, were seen during the morning, and the Jay, which seems to be increasing, was twice identified.

February 18th.—On Connaught Water the number of Tufted Ducks was reduced to eight, and the Coot was again seen. The Green Woodpecker was in the vicinity. At High Beach one Lesser Redpoll only was seen, and the highly-pitched note of the Nuthatch was heard incessantly, a poor imitation of the note brought the bird into view. During the morning the sawing note of the Great Tit was much in evidence. The Jay was identified on eight occasions in 2½ hours, probably different birds.

February 20th.—A male Reed Bunting in breeding plumage was seen on Chingford Plain. The Coot was still on Connaught Water, also a male Pochard. The Kingfisher was seen here. On Strawberry Hill two Golden-crested Wrens were seen, and a Green Woodpecker was observed driving its bill repeatedly into the ground; on the bird flying off, a hole tapering to a point was noticed in a small mound, this was, no doubt, the work of the Woodpecker. The Green Woodpecker was identified on two other occasions during the walk and the Jay on ten occasions.

February 27th.—Ground deep in snow, in many parts of the Forest quite a foot deep. Heavy snow showers fell during morning. The Coot was still on Connaught Water and one Tufted Duck, a male, only. No Moorhens were noticed on the lake, whereas usually a number may be seen. In Great Monk Wood a Tree-creeper was observed and also a male Reed Bunting feeding on the seeds of *Molinia varia* which protruded through the snow. The Nuthatch was calling at High Beach. The Jay was identified on five occasions. The absence of bird life was very remarkable.

March 5th.—Ground hard with frost. The Coot still on Connaught Water but no Tufted Ducks. The Green Woodpecker was heard on Strawberry Hill, also at High Beach. The Tree-creeper was seen in Debden Slade. A number of Lesser

Redpolls were feeding on the ground at High Beach. Five Jays were identified. Two Bullfinches were observed at Buckhurst Hill.

March 12th.—Just beyond Connaught Water a Golden-crested Wren was seen, and further on a male Reed Bunting feeding among the grass. Three Fieldfares were noticed at High Beach, both this species and Redwings have been very scarce in the Forest this winter. Another Golden-crested Wren was observed here, and farther on a Green Woodpecker. The Jay was identified on twenty-one occasions.

March 19th.—Two male and six female Tufted Ducks were on Connaught Water, but the Coot had disappeared. In Bury Wood the "cheering" note of the Greenfinch was heard for the first time this season. In Gilwell Lane a Golden-crested Wren and two Nuthatches were observed. The Jay was noticed on four occasions.

March 26.—One male and two female Tufted Ducks were on Connaught Water. Three Tree-creepers were seen together near Woodman's Glade. A small flock (about six) of Golden-crested Wrens was noticed in Bury Wood. One Tree-creeper was identified in Gilwell Lane. The Jay was observed on four occasions.

April 8th.—Higham Park, the Willow-warbler was singing faintly. A Nuthatch was heard and seen, also a Golden-crested Wren. Chingford Plain, a male and two female Reed Buntings were observed, with a flock of Chaffinches and other species. In Bury Wood the Chiffchaff was heard, the song being far from perfect. A Green Woodpecker was seen in Gilwell Lane and a Golden-crested Wren in Hawk Wood. Six Jays were identified.

April 9th.—The Chiffchaff was heard at Grimston's Oak. Among the high beeches at High Beach the Nuthatch was calling vociferously and two Tree-creepers were very busy on an oak. Near Arabin House the Chiffchaff was again heard. The Willow-warbler was singing well at Honey Lane and also near High Beach Church. Another Chiffchaff was heard in Hill Wood. Seven Jays were identified.

April 22nd.—Cuckoo heard at Higham Park.

April 23rd.—A Lapwing was observed on Chingford Plain. The Tree-pit was seen and heard at High Beach and the Cuckoo was heard calling here. The Nuthatch was heard in Hill Wood. Seven Jays were identified.

April 30th.—The Whitethroat was singing on the edge of Chingford Plain, and between there and Grimston's Oak the Lesser was heard and seen. Soon after a male and female Redstart were seen, seven of this species were identified during the morning. This species is always numerous soon after arrival, but when nesting commences they are little seen. While trying to determine whether a Garden-warbler or a Blackcap was singing, but without success, a Nightingale, in

good voice, was heard between the Old and New Epping Roads. At the bottom of Hill Wood a Nuthatch was seen working on an oak, while another was calling some distance away. Martins were flying over the reservoir at High Beach. Eight Jays were identified.

May 6th.—Several Swifts were flying over Chingford Plain. A very accessible nest of the Starling, with four eggs, was found at High Beach. The high beeches here shelter a strong colony of this interesting species. Old Woodpecker holes, which are fairly numerous, are used as nesting sites. One wonders if the Woodpeckers will hold their own. Here a Starling was heard successfully imitating the notes of the Nuthatch and Jay. A male Linnet was conspicuous on the gorse at High Beach and sang well for some time.

May 7th.—Swallows and Martins were flying near the Royal Forest Hotel. Two Turtle Doves were seen at Theydon Bois, this species is far from common in Epping Forest. The Nightjar was reeling at Long Running.

May 28th.—A male and female Red-backed Shrike were identified on Almshouse Plain, a bird all too little seen in the Forest. Blackcap and Garden-Warbler song was frequently heard between Chingford and High Beach. Two Jays were identified.

June 4th.—Almshouse Plain, heard Turtle Dove. Several Nightingales singing, Wood-Pigeon's nest, 2 eggs, birds sitting closely, also several Blackcaps and Garden-Warblers singing. At Cuckoo Pits saw male Redstart. In wood, just off Chingford Plain, great numbers of Starlings, apparently flocking. Would they be birds of the year?

June 10th.—One Wood-Warbler at Oak Hill. This bird, which was observed closely for three hours, sang almost incessantly, and was not noticed to descend to the ground once. The first portion of the sibilant song was the only part of either song which was delivered on the wing. The Nightjar was heard reeling strongly at 3.5 p.m. at Long Running.

June 11th.—Nest of Garden-Warbler, on south edge of Round Thicket; the fully fledged young got out of nest. At Cuckoo Pits, two young Redstarts with parent birds in attendance. Large number of Starlings still about.

June 18th.—A Great Spotted Woodpecker nested near Chingford. This shy bird had chosen, for a nesting site, an old pollard oak situated in what is probably one of the most frequented parts of the Forest. A good view of one of the parents, which were extremely noisy when the nest was approached, was obtained. Three days later the hole was empty, the young having evidently got off safely.

A pair of Jays, which showed in unmistakable manner their objection to the proximity of the recorder to their two newly fledged young, uttered a note so similar to the "kee-wick" of the Tawny Owl that the observer had to use his

binoculars to make certain that the note proceeded from the Jay and not from the nocturnal species.

June 18th.—The Wood-Warbler was heard again at Oak Hill, and in spite of a thorough search no nest was found. Another of this species was identified near Copped Hall grounds. A Nightjar was flushed in Long Running where Redstarts were numerous. A visit to that detached part of the woodland beyond Epping, called the Lower Forest, yielded the following species:—Willow-Warbler, Chiffchaff, Garden-Warbler feeding young, Spotted Flycatcher, Blackcap, Whitethroat feeding young, Cuckoo, Redstart, Pied Wagtail and Long-tailed Titmouse. The Jay was heard on several occasions. A lot of Garden-Warbler and some Blackcap song was also heard.

June 25th.—The decrease in volume of song was very noticeable. The voice of the Willow-Warbler was still to the fore, and the Chiffchaff no less than usual. The little Blackcap and Garden-Warbler song heard was poor. Nightingale only a few notes. Both species of Whitethroat were heard. Two Nightjars were flushed in Great Monk Wood, and a search resulted in the finding of a broken egg. Redstarts very common.

July 2nd.—The Wood-Warbler at Oak Hill was not heard. Has the bird left its haunt for the season? The Warblers very silent; in a walk embracing the wood between Chingford and High Beach, Strawberry Hill, the Monk Woods and Oak Hill, only four Willow-Warblers and one Whitethroat were heard,

July 9th.—At Strawberry Hill, a pair of Red-backed Shrikes with two young. The parent birds greatly excited and making a tremendous noise. In the same bush with the young birds found a dead adult Warbler, species unknown, spiked on a thorn, with part of head eaten. A third bird was also observed at the north edge of the same place. On Old Church Plain a female Red-backed Shrike was noted. No Willow-Warblers heard. Near Almshouse Plain and Fairmead Bottom three Chiffchaffs and two Lesser Whitethroats heard.

July 23rd.—Kingfisher seen flying over Connaught Water. In glade just beyond two Bullfinches (one male). Two Red-backed Shrikes on Strawberry Hill, the male was rapidly swaying from side to side his spread-out tail, which gave the impression that it was rotating. Heron flying over Fairmead Bottom. Seven Jays identified.

July 30th.—There was a noticeable revival of Willow-Warbler song which previously had almost disappeared. The advent of very hot weather has probably had some influence. Redbreast song started. Nuthatch heard at Fairmead Bottom. Eight Jays identified.

August 6th.—Nuthatch calling and one Tree-creeper seen at High Beach. Redbreast song increasing. Two Jays identified.

August 13th.—Very little bird life in evidence. One Willow-Warbler

- singing in Black Bushes. Pheasant with two young flushed at Mount Pleasant. Several Jays identified.
- August 20th.—A Spotted Flycatcher and two Whitethroats on Pear-tree Plain. A Bullfinch at Magpie Hill. A Kestrel flying over Hill Wood. Five Jays identified.
- August 23rd.—Seven young Tufted Ducks in down on Eagle Pond. Interesting as this record is, it is not the first occasion that this duck has nested in the Forest, as two nests with eight eggs each were found on an island on Connaught Water in 1913. One clutch was stolen while the other was successfully hatched.
- September 3rd.—Three Spotted Flycatchers near the obelisk, Hawk Wood. Pied Wagtail at Chingford Hatch.
- September 9th.—Two Little Grebes on Connaught Water. Chiffchaff heard at Buttonseed Corner, Strawberry Hill and Chingford Plain.
- September 24th.—Two Little Grebes still on Connaught Water. Green Woodpecker heard near Red Path and at Old Church Plain. Seven Jays were identified.
- October 7th.—Male Mallards on Connaught Water nearly out of eclipse plumage. Several Reed Buntings near the Warren, one male assuming winter plumage. Three Jays identified.
- October 21st.—Several Lesser Redpolls, Strawberry Hill.
- October 22nd.—A number of Redwing near the Warren; this local early arrival is probably governed by the food supply, berries being very plentiful this season. Green Woodpecker near Chingford Plain. Five Jays identified.
- November 5th.—Four Tufted Ducks on Connaught Water. Several Meadow Pipits and Redwing near the Warren. Two Reed Buntings flushed from a patch of *Molinia varia* in Great Monk Wood. Three Jays identified.
- November 19th.—Six Tufted Ducks and six Pochards on Connaught Water. One Meadow Pipit and one Reed Bunting at Fairmead Bottom, song of Redwing heard here. Considerable flock of Lesser Redpolls on higher branches of birches, High Beach. Two Bullfinches, Old Church Plain. Three Jays identified.
- November 25th.—Two Blackheaded Gulls flying over Chingford Plain. Two Coots, eight Tufted Ducks, and one Pochard, Connaught Water. Large flock of Wood Pigeons, Strawberry Hill. Redwing singing, Fairmead Bottom.
- November 26th.—Eight Tufted Ducks and one Coot, Connaught Water. Flushed Jack Snipe from swamp by Epping New Road, Fairmead Bottom. A few Redwings about at the berries. Flock of Greenfinches, Old Church Plain. Marsh Titmouse and Golden-crested Wren by High Beach Church, also some Lesser Redpolls, both on ground and at top of birches.
- December 3rd.—Green Woodpecker yaffling, Chingford Plain. Two Coots, six Tufted Ducks, and one Pochard, Connaught Water.

Flock of Fieldfares, number of Redwings increased, and one Reed Bunting near the Warren. One Tree Creeper, Strawberry Hill, and another near Earl's Path. Nuthatch heard in Hill Wood. One Golden-crested Wren, Long Hills.

December 10th.—Two Reed Buntings, Chingford Plain. One Coot and four Tufted Ducks, Connaught Water. One Hawfinch, two Lesser Redpolls and three Reed Buntings, near the Warren.

December 17th.—Fairmead Bottom, a few Redwings and Mistle-Thrush common, at the berries. Several Reed Buntings about.

December 23rd.—Eight Pochards on lake, Higham Park.

December 24th.—Reed Bunting with much black left on head, by Rangers Road. A small flock of Yellow Buntings in winter plumage on Warren Hill.

December 25th.—Flock of Coal Titmice and one Tree-Creeper, Loughton Camp. Another flock of Coal Titmice and one Tree-Creeper, Great Monk Wood. Flock (about a hundred) of Lesser Redpolls on birches, and one Tree-Creeper, Jack's Hill.

December 26th.—One male and two female Bullfinches with a few Lesser Redpolls feeding on top of birch about thirty feet high, St. Thomas's Quarters.

December 31st.—Weather mild. Two Tufted Ducks and one Coot on Connaught Water. One Bullfinch and small party of Greenfinches, Buttonseed Corner. A few Mistle-Thrushes, two Reed Buntings and one Hawfinch, near the Warren, but no Redwings were identified, the diminution of the food supply probably accounted for this. One male Bullfinch, Fairmead Bottom. One Tree-Creeper, Black Bushes. Flock of about twenty Greenfinches, Debden Slade. Only a few Lesser Redpolls at High Beach, on the higher branches of the birches. Hawk, species unknown, Buttonseed Corner. Green Woodpecker yaffling, Chingford Plain. Many Titmice, five species, were seen, including two flocks of Longtailed Titmice, passing from tree to tree in characteristic manner. Flock of eight Greenfinches, Honey Lane. Several Jackdaws by Paul's Nursery, Loughton. Seven Jays were identified by one observer and nine by another, on different routes.

Wanstead Park Heronry.—It is reported there were seventy-two nests this year. For the previous two or three years the number was seventy, whereas it used to be about fifty.

OBITUARY NOTICES.

C. A. BRIGGS. Born 1849, died 17th October, 1916.

By the death of Mr. Briggs the Society loses one of its oldest entomologists. He joined the City of London Entomological and Natural History Society in 1890, and in the early '90's was a frequent visitor to our meetings. In 1896 he retired from his firm of solicitors and removed to Lynmouth, N. Devon, and the sale of his collection of Lepidoptera at Stevens prior to his departure realised nearly £1,000. An extended obituary is given in the *Entomologist*, vol. 50, p. 23 (January, 1917).

Private S. G. LEWIS.

Private Sidney George Lewis was born at Tottenham in 1887, and was educated at the Whitechapel Foundation School, a secondary school of some repute.

After passing the necessary examinations he entered the Shoreditch Branch of the London County and Westminster Bank. The manager's statement, "That though not one of his most brilliant men, he was one who always got there, where some of the more brilliant men failed, because of his doggedness and determination to get on," probably gives a good impression of the colour of his character.

He had served three years with the R.N.V.R., and on the outbreak of the war was desirous of rejoining, but being a Territorial Force, the Bank withheld permission. In September, 1914, he joined the 20th Royal Fusiliers (Public Schools Battalion), D. Company, which was trained at Epsom, Mansfield (Notts), and Salisbury Plain. November, 1915, saw Lewis in France with the Battalion, which, after several months' experience of trench warfare, took part in the hard fighting of the Somme offensive. On the morning of July 20th, 1916, on which date his Battalion took the whole of High Wood (Le Bois Foureaux), the young soldier was wounded in the leg, and again we have evidence of the sterling character which lived beneath that modest exterior, for, in spite of his wound, he continued with his company during heavy shelling and counter attack, and was severely wounded in the chest, from which he succumbed on 27th July, 1916. All his officers were killed in this terrible action, so it has been impossible to gain information of his individual efforts on this occasion, but the Captain of A. Company writes: "They all thought him a fine fellow and very keen to do his bit."

Lewis was a keen sportsman. He took several prizes for swimming and running, and distinguished himself in the art of self-defence, winning the feather and light weight matches between the United Banks and the Stock Exchange in 1911, 1913, and 1914.

He joined the North London Natural History Society early in 1912, and in 1913, when the Bird Sanctuary Committee was formed, was elected to act as one of the Chingford Branch representatives. In this capacity he showed great enthusiasm for the scheme and did his full share of the work.

In ornithology, his chief natural history study, as in other walks of life, his unassuming manner prevented Lewis from getting full credit for his knowledge. His father writes: "Some of his happiest times were those he spent in connection with your Society."

2nd Lieut. FRANK REYNOLDS.

2nd Lieut. Frank Reynolds was born on 25th November, 1891, and was educated at Bancroft's School, Woodford. He studied chemistry, with physics as subsidiary, at University College, London, from 1910 to 1914, when he took the degree of B.Sc., passing his final examination with 2nd class honours. During his fourth year he acted as demonstrator to first year students, and did some research work. He played lacrosse for his college, and was also leader of a Bible-study circle there.

November 9th, 1914, saw the student a private in the Artists' Rifles, and in February, 1915, he was sent to France, where he finished his training and attended the Officers' Training School. In October, 1915, he obtained a commission in the 2nd Batt. Notts and Derby Regiment (Sherwood Foresters) and was soon in the firing line. Later he was made Company Bomb Officer, after receiving training in the Grenade School in France. In the spring of 1916 the young officer voluntarily went through a course of instruction at the Trench Mortar School in France, and was subsequently attached to a Trench Mortar Battery.

Reynolds was killed in the Somme fighting between Ginchy and Guillemont on 13th September, 1916. His last acts are best described by the words of his commanding officer: "His section of the battery went over to the attack, and he, as we knew he would, went on ahead to lead them. He was wounded in the arm almost at once, and refused to stop or have it bandaged. When the attack was delayed, he put the men of his section under cover, and although wounded, went on alone to observe, and was killed instantaneously. He died as he would have wished to die. His brave conduct was what I expected of him, and his men are all filled with admiration for him."

Frank Reynolds was a keen naturalist, and joined the North London Natural History Society at the end of 1911. In April, 1912, he was elected a member of the Ornithological Committee, in whose report, which appears in these pages, suitable reference was made to his work. Keen ornithologist, however, as he was, he would have preferred to have devoted his attention to the mammalia, but the Society did not possess a section devoted to this group. Some very

interesting notes which he made on the birds in the vicinity of the trenches will also be found in the extracts from minutes.

H. A. SAUZE. Born 1862, died 12th September, 1916.

The death of Mr. Sauze is another loss to the Society of one of its older members, better known perhaps to the members of the old City of London Entomological Society. In the '90's he was an active member of that Society, and in 1897 he was elected secretary, holding that office for four years, and afterwards remained on the Council for some years. His interests in natural history were general, and his exhibits and papers were always full of interest, as a reference to the *Transactions* will show. Of late years, however, business ties did not give him opportunities for keeping up his previous activity, and he was but rarely present at our meetings. He passed away after an operation, and a most pathetic incident took place at his funeral when his wife died at his graveside.

Mr. E. WILLIAMS.

Mr. E. Williams, who joined the North London Natural History Society in 1909, was a member of the staff of Messrs. W. J. Bush & Co., Ltd., of Ash Grove, Hackney, an establishment which, through the activity of an enthusiastic worker, contributed several valuable members to the ranks of the North London Society. Mr. Williams did not specialise in any branch of natural history, but took a keen and intelligent interest in plants, insects, and birds, and the general subjects that came up for discussion at the Society's meetings. Unobtrusive and unassuming, he was a genial and interesting companion on an excursion, when he had once been induced to speak of the things that interested him.

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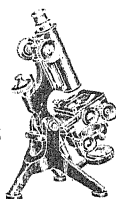
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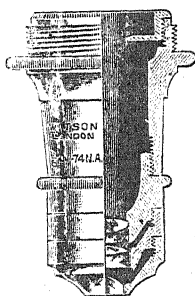
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 Tautz, P. H., F.E.S., Cranleigh, Pinner, Middlesex. (Lep.)
 Thomas, G. O., "Wilfrid Lawson Hotel," Woodford Green.
 Todd, R. G., F.E.S., "The Limes," Hadley Green, Barnet. (Lep.)
 Tremayne, C. H., 29-30, Charing Cross, S.W. 1. (Bot. Lep. Arch., Plant galls.)
 Tremayne, Mrs. L. J., 29-30, Charing Cross, S.W. 1. (Orn. Arch.)
 Van Lessen, R., B.Sc., 69, Downs Road, Clapton, E. 5.
 Warren, S. Hazzledine, F.G.S., F.Z.S., "Sherwood," Loughton. (Prehistoric Anthropology.)
 Watt, J. Mc B., Monkham's Farm, Woodford Green. (Farming and Orn.)
 Wattson, R. Marshall, 32, St. Andrew's Road, Stoke Newington, N. 16. (Arch.)
 Weighell, F., 6, Paddenswick Road, Hammersmith, W. 6.
 Wilde, Mrs. C. L., Lindfield, Marshall Road, Godalming. (Arch. Bot., Plant galls.)
 Williams, C. H., 5, Lower Belgrave Street, Eaton Square, S.W. 1. (Lep.)
 Williams, H. B., LL.B., F.E.S., 131, Queen's Road, Wimbledon, S.W. 19. (Lep.)
 Willson, A. J., 46, Dover Road, South Wanstead, Essex. (Lep.)
 Wood, H. Worsley, 31, Agate Road, Hammersmith, W. 6. (Lep.)
 Wrigley, Arthur, 29, Calthorpe Street, Grays Inn Road, W.C. 1. (geol. and pre-historic antiquities.)

* Life Members.

BRANCH ASSOCIATES.

- Allnutt, C. E., 10, Monument Street, E.C. 3.
 Allpass, Mrs., "Heydor," Endlebury Road, Chingford, E. 4.
 Allpass, E. G. H., "Heydor," Endlebury Road, Chingford, E. 4.
 Bacot, Miss A. H., York Cottage, Loughton, Essex.

- Barratt, A. K., "Idmiston," Monkham Avenue, Woodford Green.
 Connoll, Miss E., 11, Eglinton Road, Chingford, E. 4.
 Crafford, Miss N. F., 11, Eglinton Road, Chingford, E. 4.
 Earl, Miss P., Amberley, Woodside Road, Woodford Green.
 Flowers, C., 4, The Avenue, Chingford, E. 4. (Bot. Arch.)
 Fulcher, Miss, St. Helens, Woodland Road, Chingford, E. 4.
 Holloway, Miss M., 19, Buxton Road, Chingford, E. 4.
 Hornblower, A. B., 32, Forest Drive East, Leytonstone, E. 11.
 Hubbard, A. G., B.Sc., 110, Station Road, Chingford, E. 4. (Orn.)
 Hurdle, W., 2, Redland Villas, Carnarvon Road, South Woodford, E. 18
 Jones, Miss, 3, Connaught Avenue, Chingford, E. 4.
 Kilby, G. S., 54, Lombard Street, E.C. 3.
 Lees, C. H., D.Sc., F.R.S., Tunbridge Wells.
 Lewis, T. G., 61, Empress Avenue, Woodford Green.
 Loram, H. Y., 49, Buxton Road, Chingford, E. 4.
 Mathieson, Miss M. L., 7, Crescent Road, Chingford, E. 4.
 Parsons, Miss L., 36, Forest Drive East, Leytonstone, E. 11.
 Rolph, Frank, Harts Stable, Woodford Green. (Micr.)
 Roper, F. W., "Stafford Lodge," Chelmsford Road, South Woodford, E. 18. (Orn.)
 Roper, H. W., "Stafford Lodge," Chelmsford Road, South Woodford, E. 18.
 Samuelson, Miss Dorothy, Fairview, 39, The Ridgeway, Chingford, E. 4.
 Sheppard, J. H., "Simla Cottage," Snakes Lake, Woodford Green.
 Simes, Miss H., 51, Kenninghall Road, Clapton, E. 5.
 Stevenson, Mrs. H. E., 22, Wilton Grove, Wimbledon, S.W. 19.
 Stratton, Miss Isabel, 37, Buxton Road, Chingford, E. 4.
 Thomas, G. W., 86, James Lane, Leyton, E. 10. (Orn. and Fungi.)
 Watson, J. N., "Lauriston," Mayfield Avenue, Woodford Green.
 Wheeler, Mrs., "St. Conan's," Station Road, Chingford, E. 4.

COUNTRY ASSOCIATES.

- Allen, William, "Southview," Spa Road, Radipole, Weymouth. (Bot.)
 Bickham, Spencer H., Underdown, Ledbury. (British Phanerogams and Ferns.)
 Blake, Wm., Acacia Villa, Ross, Herefordshire. (Orn. & Conch.)
 Bostock, E. D., Oulton Cross, Stone. (Lep.)
 Buckley, G. G., M.D., F.S.A., Holly Bank, Manchester Road, Bury. (Lep., Dip.)
 Butler, W. E., F.E.S., Hayling House, Oxford Road, Reading. (Lep.)
 Cassall, Dr. R. T., F.E.S., The Surgery, Abertillery, Mon. (Lep.)
 Cooke, Rev. P. H., M.A., Ickleton, Great Chesterford, Essex. (Bot.)
 Culpin, M., M.B., F.R.C.S., (Capt. R.A.M.C.), Military Hospital, Cosham.
 Elford, Rodney R., Glencoe House, 139, Rosary Road, Norwich. (Ent.)
 Fison, Eliot Robert, "Sorrento," Brighton Road, Purley.
 Grubb, Walter C., Barberton, Transvaal.
 Hancock, G. D., Mount View, Uffculme, Cullompton.
 Hopkins, Prof. F. G., M.A., M.D., F.R.C.P., F.R.S., 71, Grange Road, Cambridge.
 (Biochemistry.)
 Longley, W., "Avesbrook," Brook Road, South Benfleet, Essex. (Lep.)
 Miller, Miss E., "The Croft," Rainsford Lane, Chelmsford. (Lep.)
 Moore, J. W., Middleton Dean, Middleton Hall Road, King's Norton, Birmingham.
 Pike, Oliver, G., "Duncombe," Marsworth, Tring. (Orn.)
 Porritt, G. T., Elm Lea, Dalton, Huddersfield. (Lep., Neur., Orth.)
 Portway, J. B., jun., 91, The Avenue, West Ealing, W. 13.
 Studd, E. F., M.A., B.C.L., F.E.S., Oxtou, Exeter. (Lep.)
 Ward, J. Davis, "Limehurst," Grange-over-Sands, Lancs.
 Wood, P. Worsley, M.A., Emmanuel College, Cambridge. (Field Botany).

NOTE.—The following abbreviations are used in the above lists:—Api., Apiculture; Arch., Archaeology; Ast., Astronomy; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Geol., Geology; Hem., Hemiptera; Hym., Hymenoptera; Lep., Lepidoptera; Mam., Mammalia; Micr., Microscopy; Neur., Neuroptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Rep., Reptilia; Zoo., Zoology.

EXTRACTS FROM MINUTES.

(Ornithological communications included in the Epping Forest Diary are omitted.)

January 2nd, 1917.—COMMUNICATION.—Mr. R. W. Robbins, on December 31st, 1916, noted a flock of about a dozen bullfinches (*Pyrrhula pyrrhula pileata*) flying from bush to bush on Limpsfield Common, Surrey, and on December 24th, on the Downs near Limpsfield a flock of larks (*Alda arcensis*).

January 16th.—COMMUNICATIONS.—Mr. W. E. Glegg reported twelve *Nyroca ferina* (pochard) at the lake at Grovelands, Winchmore Hill, N. Mr. L. J. Tremayne said that in Mr. C. C. Nicholson's paper on "The Botany of the District" (1915 Transactions, page 43), *Ceterach officinarum* was mentioned in a list as probably extinct in Middlesex; the plant had grown for some years in Perivale Churchyard.

ANNUAL EXHIBITION.—Mr. V. E. Shaw, *Acronyeta megacephala* var. *nigra*, from Manchester. Mr. R. T. Bowman, a bred series of *Zonosoma pendularia* from Oxshott, including examples with (1) pink suffusion on forewings almost absent, (2) space between inner and outer lines on forewings heavily suffused pink, (3) white ground colour absent, and instead, wings suffused all over, (4) dots forming inner and outer lines on both fore and hind wings elongated so as to give the appearance of being striated forms, (5) var. *nigro-subroseata*—the first examples were bred on April 27th, 1914, from wild larvæ from a Surrey wood; pairing this form with the type what is believed to be an entirely new form was obtained; whereas in var. *nigro-subroseata* the space between the inner and outer lines of the forewings is pink, in the new form it is the same colour as the marginal bands, and therefore may be described as being purple all over with the exception of the inner and outer marginal lines. Mr. C. P. Pickett, a long series of *Agriades coridon* from Herts, August, 1916, viz.:—male uppersides, varying in colour from whitish blue to almost *adonis* blue, abs. *fowleri*, *marginata*, *suffusa*, and *minor*; undersides, 2 ab. *obsoleta*, 3 with extra large spotting, one with left lower wing *obsoleta*, other wings typical, and 3 with very dark ground colour. Female uppersides, several ab. *semisyngrapha*, 5 nearly approaching *syngrapha*, 4 with the whole of the four wings black, showing no border markings, 5 with the upper wings intense black, showing no border markings, the hind wings with blue spotting over the red lunules, ab. *minor*, *inaequalis*, *roystonensis*. Female undersides, one ab. *obsoleta*, ground colour white, and one ab. *obsoleta* with left side wings minus the usual border markings, two with right side lower wing ab. *obsoleta* form

but other wings normal, 2 ab. *striata* with deep dashes in place of usual spotting. Mr. J. Riches, a specimen of *Zeuzera aesculi*, bred from an apple tree branch, the spots in central area of forewings being elongated, a striking aberration, N. London, 1916. For Mr. Dewey, of Eastbourne, a specimen of *Brenthis euphrosyne*, the basal area of wings heavily suffused, and a *B. selene* with yellow lemon ground colour, both from Eastbourne, 1916. For Mr. J. P. Mutch, bred series of *Pachnobia hyperborea*, *Brachionycha nubeculosa*, both from Rannoch, and *Hydrilla palustris* from Wicken, 1898. Mr. A. W. Mera, *Hesperia malvae* and ab. *taras* from the South Coast, and specimens from the Midlands, in which the ground colour was much lighter than those taken in the southern counties. Mr. L. W. Newman, a drawer of *Amorpha populi*, bred from selected parents and showing great variation—cream colour to rich deep pink and to extreme dark forms, all except the dark forms being of N. Kent parentage. Mr. F. G. Mann, teratological specimens of *Pyrameis atalanta*, right side smaller than left, and *Phalera bucephala*, left side wings smaller than right side. Mr. W. E. King, *Hibernia defoliaria*, a varied series from Epping Forest, mostly 1916, including banded, melanic, and brown (ab. *obscurata* Stgr.) forms. Mr. P. J. Hanson, skins of *Alauda arvensis* (skylark ♂ ♀), and one egg, *Anthus petrosus* (rock pipit), *Anthus pratensis* (meadow pipit) and egg, *Anthus trivialis* (tree pipit) and 3 eggs, with photographs of nests of all four *in situ*.

February 6th.—EXHIBITS.—Dr. Cockayne, a series of *Pararge aegeria*, bred from ova laid August, 1916, by N. Lincolnshire parents. The imagines were forced and emerged November-December, 1916, and January, 1917, and on the whole showed an extension of the yellow colour to a marked degree, one specimen in particular having very large yellow spots. Another specimen was minus the greater part of the black scaling, giving it a tawny ground colour. One had a deep black band on the underside of hindwings. Also an aberration of *Grapta c-album* captured in Montgomeryshire, September, 1916, by Lord Garioch, the hindwings heavily suffused with black, and the spots on the costa of forewings joined together. *Polyommatus icarus*, gynandromorph with stripe of blue scales and androconia on left forewing from costa to termen. *P. icarus* gynandromorph, blue scales on forewing, but no androconia. *Agriades coridon*, no androconia, left hindwing ab. *semisyngrapha*, right hindwing typical. Mr. W. E. King, *Epinephele tithonus* type and 2 specimens of ab. *excessa* from Northwood, Middlesex, 1916.

Mr. E. P. Bishop, to illustrate his paper, herbarium specimens of *Ranunculus lingua* from Moccas Park, *Saponaria officinalis* from Monmouth Cap, *Heracleum sphondylium* var. *angustifolium* from Dulas, *Campanula patula* from Clifford and Peterchurch, *Lithospermum officinale* from Monmouth Cap, *Cuscuta trifolii* from Dulas (parasitic on *Trifolium pratense*), *Utricularia vulgaris* from Moccas Park, *Colchicum autumnale* Ewyas Harold, *Equisetum sylvaticum* from Dulas. Mr. L. B. Hall, specimens from the lower Wye Valley of *Vaccinium myrsinites*, *Verbascum thapsus*, *Campanula patula*, *Inula helenium*, *Cardamine*

impatiens, *Calamintha parviflora*, *Euphorbia stricta*, *Melampyrum pratense* var. *latifolium*, *Tilia cordata*, *T. platyphyllos*.

COMMUNICATIONS.—Mr. J. Ross recorded the occurrence of *Arcyria Oerstedtii*, a mycetozoon, in Epping Forest, in September, 1916, the first record for Essex. Mr. W. E. Glegg, a flock of 20 to 30 *Turdus iliacus* (redwing) and *Turdus pilaris* (fieldfare) on Hackney Marshes, feeding placidly despite the presence of scores of people, January 28th, 1917. Mr. P. J. Hanson, 5 *Larus argentatus* (herring gulls) flying over Enfield, January 27th, 1917. Mr. L. J. Tremayne, a melanistic *Larus ridibundus* (black-headed gull) in St. James's Park, recorded two years ago and probably four years ago. The gall of *Eriophyes triradiatus* had appeared on a willow in St. James's Park. Mr. A. Bacot said the gulls on the Thames found the refuse shoots near Victoria Station a good feeding ground.

Mr. L. W. Newman recorded some experiments with the larvæ of *Bombyx rubi*. To force them to pupate earlier than in the natural state he put them into a temperature of about 75°. In three days some started to spin up, the cages meanwhile being daily sprinkled with water to keep the occupants moist. Noticing a number of the larvæ curled up under the moss, he took them into the open for a day and a night when it was frosty; on again being removed to the high temperature the larvæ at once commenced to spin up.

PAPERS.—Messrs. L. B. Hall, E. B. Bishop, L. J. Tremayne, and H. J. Burkill read "Holiday Notes from the Wye Valley." Mr. Hall and Mr. Bishop spoke of the plants found in the district. Mr. Tremayne referred to it as being rich in archæology, and instanced the beautiful early English church at Abbeydore, and the little church at Kilpeck, said to be one of the most perfect Norman churches in the kingdom. The galls found included that of *Eriophyes thomasi* on *Thymus chamaedrys*, a new addition to the British list. Mr. Burkill's best captures in lepidoptera were *Grapta c-album* and a larva of *Acronycta albi*. The number of galls observed was 166 on 72 species of plants, of which 36 seem to be new records for Britain, these 36 consisting of 12 mites, 18 midges, 3 sawflies (new host plants only), and 3 aphides. The new records included:—*Oligotrophus reaumurianus* on *Tilia platyphyllos* found by Mr. Hall, and on *T. cordata* by Mr. Burkill; *Perrisia acerocrispana* var. *rubella* on *Acer campestre*, *P. serotina* on *Hypericum maculatum*, *P. hyperici* on *Hypericum montanum*, *Eriophyes vitalbae* on *Clematis vitalba*, *E. galii* on *Galium erectum* and *Galium mollugo*, *Schizomyia galiorum* on *G. erectum* and *G. mollugo*, *Perrisia galii* on *G. mollugo*.

February 20th.—EXHIBITS.—Mr. A. W. Mera, specimens of *Himera pennaria* from Epping Forest, 1916; on the whole these were darker than those taken from the same place in previous years. Mr. R. T. Bowman, a specimen of *Acronycta megacephala* from Hackney Downs, London, suffused dull state colour, the usual chequered markings absent; also a specimen of *Ematurga atomaria* approaching ab. *unicolorata* (Staud.) from Oxshott. Mr. Russell E. James, a selection of his captures in 1916 at Oxshott, including *Anarta myrtili*, *Tephrosia*

crepuscularia, *T. bistortata*, *Taenioicampa opima* (a new record for the district), *T. gracilis*, *T. munda*, *Brephos parthenias*, *Thera firmata*, *T. obeliscata*, *Scodiona belgiaria* (a nice dark race), *Eurymene dolobraria*, *Eupithecia nanata*, *E. rectangulata*, *E. exigua*, *E. dodoneata*, *E. pusillata*, *E. lariciata*, *E. indigata*, *E. coronata*, *E. pumilata*, *Boarmia consortaria*. Four striking varieties of *Bupalus piniaria* with the white (or yellow) much reduced on the upper surface and having a striking underside, in which all the dark speckling is absent, and the longitudinal yellow streak on the hindwings stands out boldly on a clear chocolate ground. A striking form of *Aeronycta leporina*, ground colour clear creamy white with little grey powdering, and the usual marking clearly defined and black. Mr. W. E. Glegg, a stuffed specimen of *Podiceps fluviatilis* (little grebe).

COMMUNICATION.—Mr. W. E. Glegg recorded *Querquedula crecca* (teal), a flock of over 70 at Walthamstow reservoirs on February 18th.

Mr. F. G. Peacock and Mr. P. R. Peacock, of "Brierlea," Stormont Road, Highgate, were elected members.

PAPER.—Mr. Russell E. James, F.E.S., read a paper on "A Spring and Summer at Oxshott," a summary of which appears in these Transactions.

March 6th.—EXHIBITS.—Mr. C. Nicholson, F.E.S., specimens of *Merodon equestris* (large narcissus fly) showing all the usual forms, from Hale End, Fooks Cray, and Tavistock, and *Eumerus strigatus* (small narcissus fly) from Fooks Cray and Tavistock; also herbarium specimens of the *Geraniaceae*. Mr. C. S. Nicholson, specimens of all the species in the order *Geraniaceae*. Mr. E. B. Bishop, specimens of ten species of *Geraniaceae* to illustrate his paper.

COMMUNICATION.—Mr. Bishop read a communication from Mr. B. T. Lowne, one of the hon. secs. of the Catford and District Natural History Society, recording the appearance in his garden of what he thought was a natural hybrid *Geranium*, probably *G. endressi* × *versicolor*, which has produced apparently fertile seed. Plants of both supposed parents are cultivated in the garden. Mr. Lowne stated that he had made several experiments in artificial hybridization of species of *Geranium* with only partial success.

DISCUSSION.—Mr. Bishop, in opening a discussion on the botanical order *Geraniaceae*, briefly described the characteristics of the various genera and species, giving notes as to distribution and peculiarities when cultivated. No hybrids in the order were given in the London Catalogue, 10th Edition, or in Druce's "List of British Plants," but he was of opinion that in one station in Surrey *Geranium molle* was distinctly modified where growing in close proximity to *G. pyrenaicum*.

Mr. C. Nicholson in the course of the discussion said a pure white-flowered form of *G. molle* persisted in his garden at Hale End and came up true from seed year after year.

March 20th.—EXHIBITS.—Mr. A. W. Mera, a bred series of *Psilura monacha*, the ♂ ♂ showed a tendency to vary towards the dark form, but the ♀ ♀ remained typical. Mr. P. J. Hanson, skin of *Cuculus canorus* (cuckoo).

COMMUNICATIONS.—Mr. W. E. Glegg said that *Coccothraustes coccothraustes* (hawfinch) had been seen near the Warren, Epping Forest, regularly from December 10th, 1916, to March 18th, a period of over three months. This seemed to establish that during the winter the bird is very sedentary; if this is well known, none of the text-books refer to it.

LECTURE.—Mr. F. P. Bayne gave a lecture on the "Life-history of the Cuckoo," illustrated by many lantern slides. He had been fortunate in securing photos of the cuckoo ejecting first of all an egg and then the remaining occupants of the nest. The depression in the bird's back assisted in the ejection of the eggs and young birds. The zygodactyle feet, it was suggested, gave the bird a good grasp of the side of the nest.

In discussion, Mr. Glegg said, although the zygodactyle feet might assist the young cuckoo in ejecting eggs and other young birds from the nest, he felt this particular type of foot must have been of greater use in the economy of the parasite's life. It was strange that this important character, which was said to be used for only a few hours of the cuckoo's life, should be retained by the adult.

Mr. Hall stated that the normal note of the cuckoo in this country was a minor third, but in Switzerland it was a major third.

April 8rd.—Mr. P. J. Hanson, photograph of *Alcedo ispida* (kingfisher) taken at Tring, presented to the collection. Mr. A. W. Mera, living larvæ of *Triphaena ianthina*, bred from ova of a ♀ captured at Crawley Downs.

COMMUNICATION.—Mr. J. Ross said that a forest keeper at Chingford told him that blackbirds had suffered severely during the recent frost, and that he had found thirty dead in a morning.

EXHIBIT of members' lantern slides. Mr. J. Ross, mosses and hepatics; Mr. A. Bacot, slides of *Stegomyia fasciata* and its breeding places, with views of the country; Mr. V. E. Shaw, beehives and bees affected with *microsporidiosis* (Isle of Wight disease), the alighting board covered with crawling dying bees unable to fly, frames and hive covered with excreta; Mr. L. B. Hall, holiday photographs, chiefly in Switzerland; Mr. P. J. Hanson, a large number of birds' nests, the result of many years' photographic work.

April 17th.—EXHIBITS.—Mr. H. J. Burkill, the gall of *Eriophyes geranii* Can. on *Geranium sanguineum*, Linn., from Yorkshire. Mr. R. W. Robbins, *Viola hirta* from the Downs at Oxted, and the mauve variety of *V. odorata* from Limpsfield, apparently white and blue forms crossed.

COMMUNICATIONS.—Mr. S. Austin recorded *Gallinago gallinago* (common snipe), about a dozen at the Sewage Farm, Theydon Bois, several heard drumming, and *Vanellus vanellus* (lapwing) males 'tumbling' in flight at the same place, April 9th; also *Hirundo rustica* (swallow) four flying over the New River by Broxbourne Station on April 14th. Mr. L. W. Newman, *Scolopax rusticola* (woodcock) two in Bexley Woods, Kent, on April 16th, the first he had seen there, although he

had been continually in the woods for twenty years; also *Fringilla coelebs* (chaffinch) seen to chase and capture the moth *Asphalia flavicornis* and eat the abdomen.

PAPER.—Mr. C. E. Allnutt read a paper entitled "An Introduction to the Study of Prehistory." His remarks were illustrated with a large number of carefully selected prehistoric implements from different countries, and he detailed how the novice should proceed in the study, the principal works published and the favourite localities for collecting.

May 1st.—EXHIBITS.—Mr. C. Nicholson, COLEOPTERA: *Torotus meridianus* from Epping Forest, May and June, 1916; *Clytus mysticus* beaten from hawthorn, Chingford, June, 1916; *Phyllobius calvaratus* entirely devoid of the usual greenish scales covering the elytra, beaten from Scots Pine at Haresfield, Glos., June, 1916; *Anobium panicum* bred from larvæ feeding in cayenne pepper, a recognised food for the species. HEMIPTERA: *Acanthosoma haemorrhoidalis* and *A. interstinctum* (L.) beaten from birch, *Elasmotethus griseus* from alder, *Podisus luridus* from alder, willow, etc., *Piezodorus lituratus* from oak, all in the New Forest in September, 1916, and the last from heather in Epping Forest, November, 1916; *Centrotus cornutus* from willow, Haresfield, July, 1916, this species being one of the only two British species of the large family Membracidae, the members of which are characterised by their bizarre shapes due to spines, knobs, and other excrescences projecting from the thorax.

BIRD-MIGRANTS.—Mr. S. Austin recorded *Phylloscopus trochilus* (willow warbler) April 27th, Whitehall Plain, Chingford, *Cuculus canorus* (cuckoo) April 29th, Whitehall Plain, *Micropus apus* (swift) April 30th, Stamford Hill, *Hirundo rustica* (swallow) April 29th, Blackheath, *Phylloscopus collybita* (chiffchaff) April 29th, Blackheath. Mr. P. J. Hanson recorded *Cuculus canorus* April 16th, at Winchmore Hill, *Anthus trivialis* (tree pipit) April 29th, Hawk Wood, Epping Forest, *Phylloscopus collybita*, *Sylvia atricapilla* (black cap), and *Hirundo rustica* at Yardley Hill, Epping Forest, April 29th, and *Luscinia megarhynchos* (nightingale) April 29th, on the edge of Chingford Plain. Mr. J. Ross, *Phoenicurus phoenicurus* (redstart) April 29th, at Cuckoo Pits, Epping Forest. Mr. L. W. Newman, *Hirundo rustica* and *Cuculus canorus* at Bexley on April 29th, *Oenanthe oenanthe* (wheatear) at Darenth, April 29th.

COMMUNICATIONS.—Mr. L. W. Newman recorded *Celastrina argiolus*, May 1st, and *Gonepteryx rhamni* April 29th, ovipositing on open buds of blackthorn; *Pieris rapae* April 25th; the larvæ of *Arctia caia*, *Arctia villica*, and *Lasiocampa quercus* were taken May 1st, still in their winter coats. *Gastropacha quercifolia* was taken on buckthorn, on which he had never previously found it. Mr. Hanson recorded *Dryobates major anglicus* (great spotted woodpecker) at Winchmore Hill on April 29th.

PAPER.—Mr. A. W. Bacot, F.E.S., gave "Notes on the Colony of Sierra Leone," illustrating his remarks with lantern slides of Free-town and the neighbourhood.

May 15th.—EXHIBITS.—Mr. C. Nicholson, puparia of *Merodon equestris* (Narcissus fly), showing the two breathing tubes which are protruded through the puparium by the pupa within 24 hours or more of pupation—a feature common to several other Syrphid genera of Diptera. Mr. E. B. Bishop, two mite galls from Surrey, that of *Eriophyes sanguisorbae*, Can., on *Poterium sanguisorba*, Linn., and that of *E. nudus*, Nal., on *Geum urbanum*, Linn., the latter does not seem to have been recorded for Britain before. Mr. J. Ross, twigs of *Carpinus betulus* (hornbeam) with abnormal male catkins; the bracts had a midrib and were distinctly veined; some catkins had normal and abnormal bracts, and each of the twigs had quite normal catkins. Mr. R. T. Bowman, a living specimen of *Zonosoma pendularia* var. *nigro-subroseata* from Oxshott, and a smoky speckled form of *Xanthorrhoe fluctuata* from N. London. Mr. R. W. Robbins, *Paris quadrifolia* (Herb Paris) from Oxted, showing variation of four or five leaves, and of parts of the flower. Mr. E. B. Bishop, *Nepeta hederacea*, with rose-coloured flowers, originally collected at Dunstable in May, 1913, and cultivated for four years at Godalming; it has remained unchanged and has not hybridised with the type, which it has almost exterminated from the garden.

LECTURE.—Miss G. M. Towsey lectured on "Some Birds of Richmond Park." Miss Towsey had identified upwards of 70 species in the Park and on Ham Common. The lecture was finely illustrated with lantern slides from photographs and drawings of the species described.

June 5th.—EXHIBITS.—Mr. H. J. Burkill, galls of *Eriophyes tiliae* var. *exilis* on *Tilia platyphyllos* and of *Tetraneura ulmi* on *Ulmus glabra* both from Bucks, collected by Mr. Tremayne.

COMMUNICATIONS.—Mr. Burkill recorded the gall of *Eriophyes convolvens* on *Euonymus Europaeus* from Essex. Mr. S. Austin, *Saxicola rubetra* (whinchat) and *Sylvia atricapilla* (blackcap) at Enfield Sewage Farm and *Dryobates major anglicus* (great spotted woodpecker) at South Lodge, Enfield, all on May 24th. Mr. R. W. Robbins, *Passer domesticus* (sparrow) attacking *Diaphora mendica* on the wing at Limpsfield; the insect was practically uninjured. Mr. P. J. Hanson, *Lanius collurio* (red-backed shrike) on railway bank at Winchmore Hill, on May 20th, first seen there for several years.

PAPER.—Mr. R. W. Robbins gave an address on "Leaf forms and structure," describing the function of leaves and how those functions were performed.

June 19th.—EXHIBITS.—Mr. C. Nicholson, larvæ of *Selenia bilunaria*, *Taeniocampa stabilis*, *Cosmia trapezina*, *Mamestra brassicae*, *Tortrix heparana*, and *T. podana*, all from Highams Park; young larvæ of the sawfly *Nematus salicis* from Hale End; larvæ, cocoons and beetles of *Cionus scrophulariae* on knotted figwort from Hale End; very young specimens ♂ and ♀ of *Meconema varium* from oaks at Hale End. Mr. W. H. Bell, larvæ of *T. gothica*. Mr. V. E. Shaw, larvæ of *Plusia moneta* from Eltham. Mr. C. H. Williams, a long

series of *Polyommatus icarus* with some fine blue-spotted forms from various localities.

COMMUNICATIONS.—Mr. S. Austin recorded *Motacilla raii* (yellow wagtail) ♀, *Aerocephalus schoenobaenus* (sedge warbler) in song, *Emberiza schoeniclus* (reed bunting) in song, numbers of *Riparia riparia* (sand martins) and *Sylvia communis* (whitethroat) at Cuckoo Hall Sewage Farm, Lower Edmonton, on July 17th. Six pairs of *Vanellus vanellus* (lapwing) bred on the farm this year, but pied wagtails (*Motacilla lugubris*) had not bred in the filters, though several were seen about the farm. At Beaumont Manor, Wormley, on June 19th, *Muscicapa grisola* (spotted flycatcher), two pairs, one feeding young; *Motacilla lugubris* nested in roof of house, and *Aegithalus caudatus roseus* (long-tailed tit) had brought off first brood. Mr. J. Ross, *Emberiza citrinella* (yellow hammer), picking up worn specimens of *Tortrix viridana* in grass amongst trees at Hainault Forest on June 16th.

Mr. C. E. Allnutt and Mrs. Allnutt, of 159, Evering Road, Stoke Newington, were elected members.

September 4th.—EXHIBITS.—Mr. J. Ross, a series of seventeen galls on *Quercus pedunculata*, including those of *Andricus inflator*, *A. testaceipes*, *Biorrhiza aptera*, *Neuroterus fumipennis*, *N. tricolor*, *N. albipes*, *Dryophanta divisa*, and *D. longiventris*, all from Essex except *D. divisa*, which was from N. Oxon. Also photo-micrographs of part of the plant, leaves, fruit and spores of the hepatic *Lophocolea heterophylla*, and sketches of developing spores, protonemata, and very young plants of the species. Mr. J. H. Burkill, a leaf of *Populus tremula* from N. Oxon with petiole galled by the sawfly *Trichocampus riminalis*; the larvae fed better on poplar than on willow.

COMMUNICATIONS.—Mr. E. B. Bishop stated that a *Euphrasia* collected by him in company with Mr. L. J. Tremayne on the mountain side above Llanthony, Mon., on September 8th, 1916, had been diagnosed by Mr. Cedric Bucknall as *E. minima*, Jacq., var. *arbuscula*, Bucknall. This variety appears to have been recorded but twice in Britain—from Westmoreland and Derbyshire. The type form of the species was first discovered in Britain in 1908 on Exmoor, Somerset, and no other station for it is recorded. Var. *nana*, Rony., has been recorded from two localities in Westmoreland and one in Carnarvonshire (vide "Journal of Botany," May and June, 1917). Mr. Bishop reported that the results of two days' botanising round about Chiddingfold in August furnished *Epilobium lanceolatum*, Seb. and Naur., *E. roseum*, Schreb., *Centunculus minimus*, Linn., *Mentha rubra*, Sm., *M. citrata*, Ehrh. (probably not yet in flower), *M. alopecuroides*, Hull., *Pulicaria vulgaris*, Gaertn., *Polygonum maculatum*, Trim. and Dyer, *Hyoscyamus niger*, Linn., and *Helleborine media*, E. S. Marshall. Mr. L. J. Tremayne reported that Mr. H. B. Williams had taken one specimen of *Limenitis sibylla* near Holmwood, Surrey.

Mr. S. Austin recorded at Limpsfield, Surrey, *Phoenicurus phoenicurus* (redstart), *Phylloscopus trochilus* (willow warbler), *Lanius collurio* (red-backed shrike), *Motacilla raii* (yellow wagtail), *Emberiza citrinella*

(yellow bunting), *Chloris chloris* (green finch) in song, *Streptopelia turtur* (turtle dove). There were large flocks of finches in the fields.

Mr. R. W. Robbins recorded *Mentha pelegium* (pennyroyal) on Limpsfield Common, *Monotropa hypopitys* in the woods on the chalk, and *Pimpinella magna* in lanes leading to the Downs. Mr. L. B. Hall recorded *L. sibylla* in widely separated districts of West Sussex, and a large number of *Vanessa io*.

Mr. G. Brooks, of 28, Hilton Avenue, North Finchley. N., was elected a member.

PAPER.—Mr. J. Ross read a paper on "The Early Development of a Liverwort" (*Lophocolea heterophylla*).

November 6th.—EXHIBITS.—Mr. W. H. Bell, pupæ of *Dicranura vinula* and *D. bijida*, on the same piece of bark, to show the difference of cocoons; the larvæ had been bred by the exhibitor. Mr. L. B. Hall, gall of *Mecinus noctis* on capsules of *Linaria vulgaris* from Selsey, Sussex, also specimens of a hymenopteron bred from the same capsules; these he regarded as parasitic on the weevil.

COMMUNICATIONS.—Mr. H. J. Burkill recorded *Corvus corone* (carrion crow) nest in a plane tree at Chiswick. Mr. S. Austin remarked on the apparent increase of the carrion crow in the London area. While *Corvus frugilegus* (rook) is less frequently observed than it was, the crow haunts the house tops, particularly in the morning. Mr. P. J. Hanson, *Larus argentatus* (herring gull), two at Bush Hill Park, on November 2nd; *Falco tinnunculus* (kestrel) over Chingford Reservoir. Mr. J. O. Braithwaite sent a note of the capture of an adult hedgehog at Warren Road, Chingford, on September 18th, 1917. Also a black rat (*Mus rattus*) was caught in a trap at Ash Grove, Hackney; about three years ago several of these rats were brought up from the docks in bales of sandal wood.

LECTURE.—Mr. R. Marshman Wattson lectured on "Pre-Reformation Fonts." He referred to early modes of baptism, and said that after very exhaustive investigation the Rev. C. F. Rogers came to the conclusion that affusion and not submersion was almost the universal practice of the early Christians. An old print represented the ceremony of baptism in the river at Frome in Somersetshire, probably during the pastorate of his grandfather (the Rev. Benjamin Marshman), 1823-88. Both style and ornament in English pre-Reformation fonts followed on the lines of the architecture of the period. Some archaeologists assert that we have no fonts earlier than the 11th century, but the lecture described as Saxon, the fonts of Deerhurst, Little Billing, Morwenstow, and probably portions of St. Martin's, Canterbury. Norman fonts were tub-shaped, rectangular, unmounted or mounted on shafts, and a few octagonal, with other intermediate forms. Amongst the tub-shaped was the richly-ornamented font at Lullington, Somersetshire. The beautiful chalice-shaped fonts of Buckinghamshire were illustrated by examples at Aylesbury, Great Kimble, Bledlow, and Chearsley. Two views were given of the very interesting font at Hendon. A series of seven fonts of bluish-black marble from the quarries at Tournai, in Belgium, were represented by

five examples at Winchester and Lincoln Cathedrals. There appear to be no metal fonts in this country of the period before the Reformation, except the well-known leaden fonts, the majority of which are of the Norman period. These the lecturer illustrated by examples at Brookland in Romney Marsh and Walton-on-the-Hill. An illustration was also shown of a font at St. Evroult de Montfort in France; the design was identical, but the inscriptions, the signs of the Zodiac, and the names of the months were in French on the English fonts and in Latin on the French. Illustrations of early English, decorated and perpendicular fonts followed. A beautiful early English example was that at Eaton Bray, in Bedfordshire; of the decorated fonts those at All Saints, Norwich, and St. Peter's, Northampton, were shown, also the remarkable font at Lostwithiel, Cornwall, at which a horse was baptised by the soldiers during the civil wars. The finest of the later fonts were found in East Anglia, and were mostly octagonal, with figures carved in high relief, one group representing the seven sacraments, with some other subject to fill in the eighth panel.

December 4th.—ANNUAL GENERAL MEETING.—The report of the Council, the Treasurer's accounts, the reports of the Research Section, the Librarian, and the Oological Curator were presented and adopted. The officers and council were elected (as given on page 2 of cover).

[The Council's Report and Treasurer's Accounts, having already been circulated to members, are omitted.]

RESEARCH BOARD. ANNUAL REPORT FOR 1917.

War conditions have naturally hampered activities all round, but as will be seen from the accompanying Report, the various sections have been carrying on satisfactorily.

During 1917 the Research Board has been almost entirely occupied with arranging details concerning the very important change in the organisation of the Society—the division into sections. This change is necessarily an experiment, and time alone will prove whether it is to be a permanent feature of the Society. But, so far, the omens seem favourable.

The Research Board for 1917 consisted of Dr. Cockayne, Messrs. Austin, Hall, Robbins and Tremayne, with myself as President, Mr. Tremayne acting as Secretary.

Mr. Tremayne has been compelled by pressure of outside work to resign the Secretaryship. This is a matter for much regret on the part of his colleagues, and his place will not easily be filled. It is only fair to record that the greater part of the tedious work necessitated by the formation of the various sections fell upon Mr. Tremayne.

E. B. BISHOP, *President of the Research section.*

ARCHAEOLOGICAL SECTION. NINTH ANNUAL REPORT.

1. During the year the Committee made two inspections:—
 - (a) February 24th, the Chapel of St. John and the Church of St. Peter in the Tower of London.
 - (b) April 21st, the Parish Church of Edmonton.
2. On June 5th the Archaeological Section of the Society was formed and the Archaeological Research Committee, as such, ceased to exist. Twenty-one members and associates of the Society are enrolled in the section.
3. The Archaeological Section made two inspections:—
 - (a) July 14th, Earthworks of Epping Forest.
 - (b) October 6th, Chaldon Church, Surrey.
4. At the instance of the Committee, on April 17th, Mr. C. E. Allnutt gave a lecture to the Society on the Study of Prehistory, illustrated by a beautiful collection of worked flints.
5. At the instance of the Section, on November 6th, Mr. Marshman Wattson gave a lecture to the Society on Pre-Reformation Fonts in English Churches, with lantern illustrations.

E. B. BISHOP, *Chairman.*

E. CHAPMAN, *Secretary.*

March 19th, 1918.

REPORT OF BOTANICAL SECTION.

Since the formation of the Section, which has absorbed the two old Committees, two formal meetings have been held. There is every reason to believe that given normal national conditions the Section would have been a most active one, but the increasing demands in other directions upon the time of all members is responsible for the limited results we have to record.

As regards the northern portion of our area, Mr. C. S. Nicholson's health has again prevented him doing much botanical work. Under medical advice he is taking a rest from business duties, and setting out for a long sea voyage. All members will unite in wishing him a safe return, with greatly improved health.

The additional records of the southern portion are largely due to the help given by Rev. P. H. Cooke, who spent a few days of a short holiday in botanising in the outer suburban districts of Surrey and Kent. Few members realise how zealously Mr. Cooke worked the old (now northern) district before his removal from London, and for how many valuable records in the past we are indebted to him. We cordially appreciate the assistance given to us by him during 1917, and trust that other members will follow his example.

Two excursions of the Plant Galls Section, in the Weybridge district, also resulted in some useful new records being furnished to the Botanical Section, for which we are truly grateful.

During 1917, 132 new species were added to the Southern District List, the most noteworthy being the following:—

<i>Sisymbrium pannonicum</i> , Jacq.	<i>Chenopodium serotinum</i> , L.
(From two sub-districts—in one almost certainly truly wild, in the other obviously a "cast-out.")	<i>Euphorbia esula</i> , L.
	<i>Helleborine violacea</i> , Druce.
	<i>Paris quadrifolia</i> , L.
<i>Moenchia erecta</i> , Gaertn., Mey, Scherb.	<i>Luzula forsteri</i> × <i>pilosa</i> (= <i>Borreri</i> , Bromf).
<i>Agrimonia odorata</i> , Mill.	<i>Luzula sylvatica</i> , Gaud.
<i>Pimpinella major</i> , Huds.	<i>Lemna gibba</i> , L.
<i>Galium erectum</i> , Huds.	" <i>polyrrhiza</i> , L.
" <i>asperum</i> , Schreb.	<i>Carex strigosa</i> , Huds.
<i>Monotropa hypopitys</i> , L.	" <i>vesicaria</i> , L.
<i>Symphytum peregrinum</i> , Ledeb.	<i>Cynosurus echinatus</i> , L.
<i>Mentha pulegium</i> , L.	<i>Ophioglossum vulgatum</i> , L.

Also a few casuals, etc., which have not been identified. The assistance of all members is invited with a view to perfecting our District records, especially in the southern sub-districts, 2 (Wimbledon), 4 (Norwood), 6 (Caterham), and 9 (Kent Marshes).

R. W. ROBBINS, *Chairman*.

C. L. WILDE, *Secretary*.

February 12th, 1918.

LEPIDOPTERA COMMITTEE—REPORT FOR 1917.

Early in the year it was proposed to split up the Society into sections, and the decision to do so having been arrived at, the matter

was reported to the members at an inaugural meeting held at Guy's Hospital, on April 24th. Mr. Bacot was elected Chairman of the Lepidoptera Section, and other officers and members of committee duly appointed.

It was decided to hold sectional meetings once a month, commencing with the autumn session. Meetings were accordingly held in September, October, November and December, but the attendance was small, owing either to many members being away on active service or to their time being fully occupied with work of national importance.

Among the exhibits the following are worthy of mention:—Mr. Newman exhibited uncommon varieties of *Abraeus grossulariata*, including vars. *lacticolor* (deleted), *nigrosparsata*, *lutea*, *flavipalliata*, *centralipunctata*, and forms of var. *varleyata* with the white on the shoulder of the forewings almost deleted. He also exhibited, on behalf of Mr. G. Oliver, selected forms of *Lycaena corydon* var. *syngrapha* and var. *semisyngrapha*. Mr. Bowman exhibited beautiful varieties of *Zonosoma pendularia* var. *nigro-subroseata*, including an aberrant form in which the white lines on the upper wings were entirely missing, the purple colour of the marginal bands merging into the pink ground colouration. Also a long series of *Hemerophila abruptaria*, including typical and melanic examples both of the spring and summer broods. The melanic examples ranged from pale brown to dark chocolate. Mr. Mera showed examples of the new geometer *Cidaria otregiata*. It is closely allied to *C. sajumata*, but differs from it in shape of wing, and is, moreover, double brooded.

Mr. Mera reported having seen an example of *Argynnis adippe* in his garden at Loughton, Mr. G. Brooks spoke of the unusual occurrence at Finchley of *Vanessa io*, and Mr. Bowman reported the capture at Horsley of *Vanessa polychloros* and *Colias edusa*.

The Committee endeavoured to stimulate the interest of the section by circularising all members, requesting them to make as many notes as possible during the summer, in view of the fact that short notes and exhibits would constitute the chief features of the sectional meetings during the next session.

R. T. BOWMAN, *Secretary*.

ORNITHOLOGICAL COMMITTEE. REPORT FOR 1917.

1. Owing to various circumstances the Committee is still compelled to confine its practical work in the main to the northern part of the Society's district, although it is ready to welcome records from the southern district. Three species new to the northern area have been recorded during the past year, making the total number 149.

2. The new occurrences in the northern district are as follows:—*Somateria mollissima* (eider duck): A party of seven were observed on the Roding, at Ilford, on February 2nd, 1917, and ten on March 10th, 1917; reported by Mr. C. Murray (see *British Birds*, vol. xi., p. 234). *Buteo buteo* (buzzard): This species has been observed two years in succession at Ilford; in 1916 a single bird was about on August 23rd-27th, September 26th, and October 8th; and in 1917 a pair frequented the same spot from July 20th-23rd inclusive; reported by

Mr. C. Murray (see *British Birds*, vol. xi., p. 212). *Glauclion clangula* (golden-eye): One seen on the Thames at Kew on March 18th, 1917; reported by Mr. J. E. S. Dallas, per S.A.

3. Other interesting records are as follows:—NORTHERN DISTRICT.—*Totanus ochropus* (green sandpiper): Very good view of one on Theydon Bois sewage farm on April 29th, 1917; recorded by Mr. F. J. Stubbs, per S.A. *Crex crex* (corncrake): Extract from letter, Mr. F. J. Stubbs to S.A., "The corncrake is back here, now calling at the rate of 108 to the minute against its 90-94 in 1914 (*cf. Zoologist* for that year), and the normal 60-64 of other counties; on Sunday night, May 27th, while on S.C. duty (listening to the bird), my companions questioned about the sex of the vocalist (male, of course), and I said that the 'piping note of the female was very rarely heard, even in good corncrake counties. Actually, while my tongue was finishing the sentence, a ringing 'Peep-peep, peep-peep' came from the grass in front of us, the male calling meanwhile; as a matter of fact, he ran 1 hour 35 minutes before dropping a note. Our bird uttered only four notes and then remained silent." *Pica pica* (magpie): Bird sitting on nest with four eggs at Warlies, Essex, May 2nd, 1914; reported by Lt. D. H. Meares, per A.B. *Fringilla montifringilla* (brambling): Female seen at High Beach, April 12, 1918; reported by Lt. D. H. Meares, per A.B. *Carine noctua* (little owl): Two nests found in April, 1914, containing three eggs each, in neighbourhood of Brentwood, by Lt. D. H. Meares (see *British Birds*, vol. x., p. 271). Mr. C. H. Roper, per S.A., reports on the species as follows:—In the spring of 1905 ten imported birds were released at Loughton; since then they have bred regularly in the neighbourhood and in 1916 young birds were seen on the wing. Their call can be heard on almost any night. *Phylloscopus sibilatrix* (wood warbler): The frequent reports of this species have been quite a feature of the past season in Epping Forest; it has been seen or heard by members and friends on the following dates: May 18th and 19th, and June 3rd, 16th, 21st, 23rd, and 30th; two nests were found, one deserted and the other thought to have been brought off. *Gallinago gallinago* (common snipe): Nest containing four eggs, found on Theydon Bois sewage farm on May 18th, 1917; reported by P. J. H. and A. B. *Spinus spinus* (siskin): About 30 seen feeding on alders, Highams Park, March 17th, 1917; reported by W. E. G. and S. A. *Rallus aquaticus* (water rail): A view of this bird was had at unusually close quarters at Theydon Garrow on December 16th, 1917; reported by Mr. F. J. Stubbs, per S. A. SOUTHERN DISTRICT.—*Saxicola rubicola* (stonechat): On May 9th, 1917, two nests were found on Dartford Heath, one with young just hatched; reported by Lt. D. H. Meares, per A. B. *Melizophilus undatus dartfordiensis* (Dartford warbler): Several birds were disturbed during military manoeuvres in Surrey, on many occasions during the autumn of 1915 by the late Capt. C. S. Meares; reported by Lt. D. H. Meares, per A. B. *Loxia curvirostra* (crossbill): Six pairs of birds were nesting in Bostall Woods, Woolwich, on March 19th, 1910, and two birds flushed from nests on March 29th, 1910, the nests were inaccessible; reported by Lt. D. H. Meares, per A. B. *Oenanthe*

oenanthe (wheatear): Seen at Darenth, Kent, on April 29th, 1917; reported by Mr. L. W. Newman.

4. The Committee has held four business meetings, two informal meetings, and one excursion during the year. Mr. W. E. Glegg, having joined the Army, resigned his position as secretary. Messrs. A. Brown and J. Ross have been elected members of the Committee, the former being appointed secretary *pro tem*. The Committee now number five.

5. The Committee arranged for three papers for the Syllabus;— On March 20th, by Mr. F. P. Bayne, on the "Life-History of the Cuckoo"; on May 15th, by Miss A. Hibbert-Ware, "Notes on some Epping Forest Birds"; and on October 2nd, by Mr. F. J. Stubbs, Curator of the Stepney Borough Museum, on "Bird Migration." Mr. Stubbs' paper was postponed, and, owing to illness, Miss Hibbert-Ware was obliged to cancel her engagement, her place being taken by Miss G. M. Towsey, who read a paper on the "Birds of Richmond Park."

6. The Committee having carefully considered the scheme of Research Sections agreed to by the Council, a Special Meeting was called on November 20th, to which all members of the Society interested in Ornithology were invited, and as a result an Ornithological Section was formed. This Report will therefore be the last issued by the old Research Committee.

7. The Report on the Birds of Epping Forest in diary form has been continued, and will be published in the *Transactions*.

8. Owing to lack of opportunity, the work done by the Committee under the "British Birds" marking scheme has been almost nil, only two birds having been ringed during the season. One recovery is reported:—*Turdus merula* (blackbird), ringed, at Chingford, May 7th, 1911, recovered at the same place on February 16th, 1917.

9. A communication entitled "Notes on the Birds of the Fylde (Lancashire)," received from Mr. W. E. Glegg, and some letters from Mr. Oliver G. Pike, on "Bird Life at the Front in France," were read at meetings of the Society.

10. The photographic collection has been increased by the addition of several of Mr. P. J. Hanson's photographs, the total number of species shown being 71, and of nests 93.

For the Ornithological Committee,

ARTHUR BROWN, *Secretary*.

November 26th, 1917.

PLANT GALL COMMITTEE. REPORT FOR 1917.

Owing to war conditions the work in this section has been of necessity limited, but 247 galls have been recorded, occurring in 38 orders of plants, and specimens of the majority have been preserved. These records are not confined to the Society's special district, as it was considered that, at the present stage of the study of this group, this limitation would not be advisable, and would exclude many of the most interesting species.

Records and specimens have been received from Mrs. Wilde, E. B. Bishop, H. J. Burkill, J. Ross, and L. J. Tremayne.

It is much to be regretted that Mr. H. J. Burkill has been unable to afford the time to complete his records for 1917.

As far as I have been able to ascertain, the following appear to be new records for Britain, (N.h.p.) signifying New host plant:—

- On *Viola hirta*. L.—*Perrisia affinis*. Kieff. Limpsfield, Surrey. L.B.H. (N.h.p.)
- On *Stellaria holostea*. L.—*Perrisia silvicola*. Whitechurch, Mx. L.B.H.
- On *Tilia platyphyllos*. Scop.—*Eriophyes tiliae* var. *exilis*. Nal. Symonds Yat. W. Glos. L.B.H.
- On *Acer Pseudoplatanus*. L.—An *Eriophyid* (Houard No. 9976). Near Newgate Street, Herts. L.B.H.
- On *Acer Campestre*. L.—*Perrisia tympani*. Kieff. Near Chichester, W. Sussex. L.B.H.
- On *Medicago lupulina*. L.—*Perrisia lupulinae*. Kieff. Bosham, etc., W. Sussex. L.B.H.
- On *Trifolium repens*. L.—*Eriophyes plicator* var. *trifolii*. Nal. Herts and W. Sussex.
- On *Vicia tetrasperma*. Moench. *Perrisia viciae*. Kieff. Selsey, W. Sussex. E.B.B. and L.B.H. (N.h.p.)
- On *Cratogeomys monogyna*. Jacq.—*Myzus Oxycanthae*. Koch. North Mimms, Herts. L.B.H.
- On *Pimpinella saxifraga*. L.—*Lasioptera caryophila*. F. Löw. Biggin Hill, Kent. L.B.H. (N.h.p.)
- On *Peucedanum sativum*. B. & H.—*Macrolabis corrugans*. F. Löw. Biggin Hill, Kent. L.B.H. (N.h.p.)
- On *Galium mollugo*. L.—A *Cecidomyid*. Amberley, W. Sussex. June, 1917. L.B.H.
- Flattened conical projection on stem. Agrees with Houard's description of his No. 7372 on *G. verum*, which was recorded for Britain by Bagnall in *Ent. Rec.*, October, 1917. Apparently not hitherto recorded on *G. mollugo*.
- Perrisia* sp. (Houard 5216). Bosham, W. Sussex. L.B.H.
- On *Asperula cynanchica*. L.—*Phyllocoptus minutus*. Nal. Near Chichester, W. Sussex. L.B.H.
- On *Bidens cernua*. L.—*Aphis* sp. (Houard 5647). Near Fishbourne, W. Sussex. L.B.H.
- On *Clinopodium vulgare*. L.—*Eriophyes* sp. (Houard 4890). Bury, W. Sussex. L.B.H.
- On *Chenopodium hybridum*. L.—*Aphis atriplicis*. L. Grange Park, Middlesex. L.B.H. Houard does not mention it as occurring on this species. (N.h.p.)
- On *Betula pubescens*. Ehrh.—*Contarinia betulina*. Kieff. Stanmore, Middlesex. J.R., H.J.B., and L.B.H. Swanton gives this on *B. alba* only.
- On *Quercus ilex*. L.—*Eriophyes ilicis*. Can. East Lavant, W. Sussex. L.B.H.
- On *Salix purpurea*. L. var. *Woolgariana*. (Borr.).—*Perrisia terminalis*. H. Löw. Newhaw, Surrey. (N.h.p.)

- On *Salix cinerea*. L.—*Oligotrophus capreae*. Winn. Essex. J.R. Herts. L.B.H. (N.h.p.)
Oligotrophus capreae. Winn. var. *major*. Kieff. Herts, Middlesex, W. Sussex. L.B.H.
 Both the above galls are common and probably have been observed frequently, but no record has been traced.
Perrisia marginemtorquens. Winn. Essex. J.R. Herts. Kent. L.B.H. (N.h.p.)
Rhabdophaga nervorum. Kieff. High Beach, Essex. J.R. Stanmore, Middlesex. L.B.H. Recorded on *S. capraea* by Mr. H. J. Burkill in 1916.
 On *Salix myrsinites*. L. \times *nigricans*. Sm.—*Pontania salicis*. Christ. Found on specimens of this willow gathered in Perthshire by Mr. James Groves in 1891; not hitherto recorded on this form in Britain.
 On *Populus tremula*. L.—*Harmandia globuli*. Rübs. Surrey, Middlesex, Herts. L.B.H.

LESLIE B. HALL.

January, 1918.

CHINGFORD BRANCH. REPORT FOR 1917.

There has been another small increase in membership and no resignations, and there is little doubt that, when peace conditions once more prevail, the Chingford local section will receive still further additions to its numbers.

The largest attendance at the meetings was 32 and the smallest 10, the average being a little under last year.

Great regret was felt by the members at the loss of Capt. T. Brooke, a former member of the Society, who fell in France.

Papers or lectures were given as follows:—"Chingford, Ancient and Modern," by Rev. Canon Russell, M.A.; "British Poisonous Plants," by G. Nicholson, F.E.S.; "Some Common Wild Birds of Chingford," by A. G. Hubbard, B.Sc.; "The Wild Flowers of my Garden," by F. G. Gould; "Some European Wild Mammals," by E. Samuelson; "The Origin of some Cultivated Plants," by R. W. Robbins; and "Ornithological Notes on an Alpine Holiday," by S. Austin.

In June, a visit to the Zoological Gardens was greatly enjoyed by those members present.

Mr. R. T. Bowman's Lepidoptera paper on October 8th was postponed until next Session, owing to the fact that at the time air raids were becoming chronic.

The Chairman of the branch is the Rev. Canon Russell, M.A., and the Secretary, E. Samuelson, 39, The Ridgeway, Chingford, E. 4.

A SPRING AND SUMMER AT OXSHOTT.

Having by force of circumstances to spend a considerable part of the Spring and Summer of 1916 with my two boys at Oxshott, I had the opportunity of working the Lepidoptera of the district more or less consecutively for nearly four months.

Being under doctors's orders, I had to take things quietly, and I really think one sees more insects when compelled to slack, for certainly taken all round, I never saw more than during this season.

Whatever direction was taken, there was plenty to do, and I should be surprised if any other district within the 20-mile radius of London yielded so many species as Oxshott. It is the variety of country that at once accounts for its large fauna and constitutes its great charm.

For anyone who does not know it, I must roughly describe it. Take first its most characteristic side—the Esher side—and walk to the Black Pond. There is the heath itself with its fringe of birches to start with, where you can sit and look right away to Box Hill and beyond, while *Macrothylacia rubi* and *Anarta myrtilli* dash round about you; then the glorious pines of which I never tire—miles of them; next a larch plantation, whose early pink and tender green showing among the sombre pines are to my mind one of the most beautiful of Spring's touches.

These again, with their later fields of bracken, give way as the ground falls to stately beeches, passing lastly into mixed pines and Spanish chestnuts, amidst which one at last sees the pond itself with its sea of yellow reeds. On the other side of the Esher Road there are the birches of Arbrook Common with their many "hook-tips" and "mochas," and the grassy swamps where we had successful encounters with *Anax imperator*.

But cross the railway and you might be in a different county. You are at once in the land of woods, meadows and Spring flowers. Steer Lane with its willows and elms and woodland rides affords one of the best general dusking grounds I know, and in July I have only seen its superior as regards numbers in the palmy days of Chattenden Woods—or the present days for aught I know, as it is long since I visited them.

The large woods on the Epsom side of the lane I never explored seriously, though out of them Mr. Percy Richards produced the best variety of *Melanippe montanata* I have ever seen, and a borderless *Lomaspilis marginata* on the same day; and I should think they have great possibilities. Still more variety is afforded by a walk along the Leatherhead Road. A long fence on the way is one of the most prolific I have ever met, and was nearly always examined on dull days after we discovered its existence. Then turning in to the left you have the beautiful park country and big oaks of the Leatherhead Golf Course. We beat for larvæ here repeatedly and were never interfered with.

On the other side of the road is a tangled mass of willows (which produced little except larvæ of *Hypsipetes elutata* in bulk), and in

between, patches of open ground, barren except for quantities of ragwort. A still further variety of country comes fairly in the Oxshott district and that is the river and water meadows of Cobham, but this part we never worked.

The stations down the line—Effingham, Horsley and Clandon—are of course all well known to you, but Effingham was the only district worked at all, and the only one included in my paper. The large pinewood here is different from the Oxshott Woods, in that it includes many spruce firs, and it also produced a few different species. Box Hill with its chalk, juniper and yew has of course its own fauna, and though easily workable, is a centre of its own, so I have not included it.

I first opened the campaign on March 19th, the day on which my wife and I went to secure rooms.

Having finished our work, I walked through the pines to Esher and Claygate, and on the larches already mentioned came across *Tephrosia bistortata* in some numbers. They had evidently been out for some days, as one or two were already worn. This species continued here in plenty until April 21st, when there appeared to be a sudden wave of fresh emergences. The numbers on this day were immense, frequently as many as three or four on a tree. A few occurred here and there elsewhere, but the larches were their head-quarters, and they continued in waning numbers until May 17th, when the last female was seen. *Tephrosia crepuscularia* appeared on May 12th, thus considerably overlapping *bistortata*, and as some numbers were seen on this evening, it had probably been out for some days. It had anyway been six days since my last visit to the spot.

They continued increasingly for a week or more and remained in evidence until June 10th, and at Effingham even for a week longer.

I have never before had a similar opportunity for comparing the habits of these two closely allied species. The numbers were great, and both species being practically confined to one spot, the differences in their resting habits were most striking.

Firstly, on the whole *crepuscularia* sat higher on the tree than *bistortata*, the latter species frequently resting with its wings almost on the earth. In fact I not infrequently came across specimens that appeared to be crippled from this cause—the wings having insufficient room to expand. This variation in height however was by no means constant. The great point of difference—and a practically invariable one—was the position of the costal margins of the forewings. In *bistortata* they formed an angle little greater than a right angle—variable in degree, but always a very decided angle—while in *crepuscularia* they were either in a straight line, or else pushed still more forward. Out of many hundreds of each species, I scarcely saw a single variation from this rule, and another difference, not quite so constant, but holding good, I should say, in 90% of cases, was that *bistortata* sat head upwards or nearly so, while *crepuscularia* sat sideways—the costal margins forming a line pointing to the ground.

Apart from their habits I never saw a specimen about which I had any doubt, as in all its variations, *bistortata* has what I should

describe as a heaviness of marking and an olive touch in its colouring that is unmistakeable.

It varied very considerably in depth of colour and markings but not in any constant direction. *Crepuscularia* on the other hand had a well-defined melanic form, powdered with black scales and the ordinary markings partially obscured. This form occurred in about a 7% proportion, with a few intermediates, but the dark race was well defined and the intermediates were rare.

What surprised me was the total non-appearance of the partial second brood of *bistortata*, but as we left on July 16th and the season was a late one, it may not have been out, although I have taken it well before this date elsewhere.

I have run away, however, into the Summer and must hark back to my starting point. We settled in on March 27th, and the first tentative attempt at sallows was made down the Esher Road on April 3rd. They were scarcely out and the sum total was eight common moths, so we waited a bit and tried again in Steer Lane on April 10th. The sallows here were more forward than on the Esher Road, and consequently we were nearly late. However picking the later bushes we did very well between this date and April 23rd.

Certain species I was myself glad to replenish, and as much was new to my boy, we soon had plenty of setting. Of course the bulk was made up of *cruda*, *stabilis*, etc., but one is always glad to overhaul these and *instabilis* for nice forms and we had besides a good sprinkling of *Pachnobia rubricosa*, *Taeniocampa munda*, *T. gracilis*, and *T. miniosa*, especially the latter.

Then on the night of the 23rd I had a surprise.

The Steer Lane sallows were almost over, and during the day I had discovered a large male bush over a pond and some way from the road. We visited this last of all, having previously found very few moths in Steer Lane. One of these however—which was very lively and had to be boxed quickly—struck me as greatly resembling *Taeniocampa opima*, and I put it carefully aside for further examination.

I should think nearly all the moths of the neighbourhood were on my special bush. I was working with an umbrella and the tree was hard to get at without falling into the pond, but I managed to get the "brolley" well placed and a stick hooked over the main branch, which unfortunately shook the whole tree at once.

The moths came down like a snow storm, and covered the umbrella, the pond and everything else.

I was glad to see that they were able to rise freely from the surface of the water, so long as they did so before the wings became sodden. The umbrella at this one shake contained every species that we had hitherto taken, and to my great surprise a second specimen of the moth taken just previously. I had time to look at this one, and although quite new to me in its living state, I immediately recognised it as an undoubted *T. opima*—almost the last locality in which I should have expected it. Both specimens proved to be freshly out. The bush was a large one, and the number of moths that must have fallen into the

pond is inconceivable. With the aid of an acetylene lamp and a net I fished out some *gracilis* and *miniosa*, and we waited a bit and tried another shake, but with comparatively small results. I was away in town for the next two nights, but asked Mr. Carr to try his luck with my special bush. The result was that on the 24th and 25th he and Mr. Green took six more *opima*—all from the one bush. On the 26th it was nearly dead, and on the 27th quite on its last legs; but in spite of this I took respectively three and six *opima*; thus with Mr. Carr's specimens making a total of seventeen, all but one from this one bush. The question arises, has the species been here long or is it an artificial introduction? From the several collectors I know who have worked Steer Lane for years, I have heard no mention of the species and further information on the subject would be interesting.

This finished the sallows, and although *T. populeti* did not appear, it occurred freely later on in the larva state, so with the advent of *T. opima*, Oxshott can boast the complete family circle of *Taeniocampas*.

Panolis piniperda never came to the sallows, although I examined a few bushes up near the pines several times, but it occurred repeatedly on the pine trunks and was much more conspicuous than I expected. The first was taken on April 2nd, and it continued in fair condition right away until May 31st, a large proportion having crippled hind-wings.

Dusking on the sallow evenings produced *Selenia bilunaria*, *Anticlea badiata*, *A. nigrofasciata*, and *Lobophora lobulata*.

All this time *Brephos parthenias* had been on the wing in numbers, but hard to catch. I was interested to find one at rest in the early morning on a rusty iron rail and most wonderfully protected in colour.

Other species taken during this period were *Sarrothripa rerayana*, *Eupithecia punctilata*, *Pachycnemis hippocastanaria*, and *Asphalia flaricornis*, the latter species again affording me an example of its natural daytime flight. I watched one specimen flying round some birches for nearly half an hour, which I take to have been a female ovipositing, as it made frequent short rests; but I could never get near enough to examine it, as it kept well up among the tree tops. The time would be about 1 to 1.30.

At the same time the pines produced many larvæ of *Thera firmata*, and *T. obeliscata*, and in less numbers *Ellopija fasciaria*, but the first named is a tedious little beggar to keep. It is better left until the time for beating *Panolis piniperda* when it actually has grown a little. *Saturnia carpinis* in the perfect state we almost missed although we saw just one male, but it was evidently plentiful enough. We found cocoons in March, ova and small larvæ in May, and in June half-grown larvæ were in fair numbers. They were by no means confined to the heath, as one batch of small larvæ was found on bramble and blackthorn in a woodland glade off Steer Lane—a mile or more away.

It has been a curiously arranged summer. The sallows were late and the hot weather round about and just after Easter brought along the summer species early, so that spring collecting merged into summer without that rather barren period one usually finds after the

sallows are done. There was always plenty of life on the heath. Before *B. parthenias* finished, and before April was done, such things as *Tephrosia punctulata*, *Ematurga atomaria*, *Thera obeliscata* and *Eupithecia pumilata* were well out and other species almost immediately after. May in fact was a very prolific month and by the 15th we were into the Summer campaign.

By this date, what I should consider to be Oxshott's most characteristic species *Bupalus piniaria* was out, also *Anarta myrtilli*, *Drepana cultraria* and *Zonosoma pendularia*, while *Drepana hamula*, *D. falcula*, *D. lacertula*, *Scodionia belgiaria*, and many others followed fast, including *Macrothylacia rubi*.

The males of this last-named species flew over the heath in the early evening in immense numbers for some weeks, and females were picked up at rest from time to time.

S. belgiaria first appeared on May 17th, when a male was found at rest by day on the heath, so I lost no time and went out that same night. None were found however except a late larva, which produced a female specimen on June 18th—three days later than the last specimen taken at large.

A few nights afterwards males were well out and a fine series was taken, distinctly darker on the whole than those I have taken on Butts Lawn at Brockenhurst.

While by day the species rests with the wings flat, at night they all hang from the heather with wings back to back, as if only just expanded. At least this was so on most nights, but on others they were restless and were all taken on the wing. The nights when they flew, I noticed were those that had a slightly misty chill in the air—a condition that usually induces sluggishness rather than activity. The resting habit of the females was similar to the males, but I never saw one fly at night. On the other hand they were more readily walked up than the males by day, especially in the late afternoon.

As the end of May approached new species appeared every day and in increasing numbers. A meadow that earlier was a mass of cowslips became alive with *Euclidia mi*, *E. glyphica*, *Nisoniades tages*, *Hesperia malca* and *Pyrausta purpuralis*, with a few *Brenthis euphrosyne*, *Helica tenebrata*, and *Phytometra aenea* among them, and an afternoon among the birches of Arbrook Common produced *Zonosoma pendularia*, *Drepana falcula* and *D. lacertula* in some numbers. Many other interesting species turned up each day, such as *Drepana hamula*, *Spilosoma mendica*, *Lithosia sororecula*, *Agrotis puta*, *Hypena rostralis*, *Eurymene dolabraria*, and *Eupisteria heparata*, the latter all over the place, but centralised in an alder bed. Of *mendica* we took females flying by day as usual, and also the first male I have ever taken at large, at rest on a fence.

Light at this time would have been interesting, but of course was impossible. During the *belgiaria* period I always expected to be pulled up, as we were all over the heath with one or sometimes two acetylene lanterns. However we were never disturbed, although I expect the reason was that the one and only policeman of the neighbourhood was on his beat in another direction, and "Specials" were apparently non-

existent. Several moths used to fly up to the lights, among them *Lophopteryx camelina*, *D. hamula*, and *E. dolabraria*, although we always gave up by eleven o'clock (Summer time).

The reason for this was partly due to my having to take considerable rest, but also to knowledge of the fact that soon after eleven the Esher Road became the constable's beat.

*Eupithecia*s just now were well to the fore—*E. nanata* on the Heath and *E. pusillata*, *E. lariciata*, and *E. indigata* among the pines and larches. The latter continued for some time and I found the best way to obtain it was to tap the inside dead branches of small pines on the edge of the heath, when the best fresh specimens would flutter slowly to the ground and could be boxed.

From now onwards we commenced searching the beech trunks for *Stauropus fagi*, which I know occurs, but in this we were not successful. These beeches and the large smooth-trunked Spanish chestnuts were nevertheless quite remunerative. *Dasychira pudibunda* was a prominent species and it is astonishing what an immense insect it looks on a dark tree-trunk, with its long woolley legs extended in front to their utmost stretch. A very fine lot of *Boarmia consortaria* occurred here (and in fewer numbers elsewhere) and it was interesting to find there was a melanic race of this species parallel with the form of *Tephrosia crepuscularia*, but perhaps not quite so striking. I have a number of pupæ from this form and hope to breed some still darker. *Tephrosia cetersaria* was here, also *Nola cristulalis*, always head downwards, as usual, and a nice lot of *Eupithecia coronata*.

Thus once again *coronata* was associated with Spanish chestnut, as I have always found it to be at Brentwood and elsewhere. We never took more than one a day except on June 15th. On this day we could not get away from it. We took it freely from the beeches and chestnuts—four on one tree; another on palings going through the larches and several more on the fence in the main road between the station and the village. After this one day we saw no more at all.

Tephrosia consonaria does not appear to occur at Oxshott, but hearing from Mr. Carr that it was at Effingham we adjourned there on May 24th, and on this and subsequent visits found it in plenty on the pine and spruce-fir trunks. It is much more skittish than other members of the family and in its habits is more like *Boarmia repandata* than other members of its own genus.

The only *Hemaris fuciformis* of the summer was seen here, but otherwise, apart from *T. consonaria* and a cocoon of *Hylophila bicolorana* spun up in a curious situation on a reed stem, Effingham was rather disappointing. *Hamearis lucina* occurred, but this was also on the edge of the "Cowslip" field at Oxshott.

There has been much written in the papers about the effect of larvæ on the oak trees this year, and in the Oxshott district the denudation of the trees was visible in its most extreme form. In some of the oak woods the trees were literally as bare as in winter and when we first went larva-beating, I really was at a loss as to where to start.

It scarcely seemed possible that many larvæ could be living on the bare branches, as there was literally nothing left for them to feed on.

However taking the few trees that had a scrap of green left, we had a great haul. It was no wonder that the leaves were gone—the wonder was that any larvæ were left alive. The bulk were *Tortrix viridana*, *Cheimatobia brunata*, various *Hybernias*, *Calymnia trapeznia*, *Taenioecampa cruda* and a large grey sawfly—the latter in immense numbers. But many better larvæ were plentiful also, and the result quite recalled a good day in the New Forest—*Hylophila bicolorana*, *Bithys quercus*, *Asphalia ridens*, *A. diluta*, *Psilura monacha*, and quantities of *Taenioecampa miniosa*—in one instance eighteen of the latter in one beat. In fact all larvæ were abundant in early June, and the other most interesting species were *Taenioecampa populeti* (quite commonly crawling along the top of the Leatherhead Road fence under some high poplars), *Amphipyra pyramidea*, *Calymnia affinis* and *C. pyralina* in some numbers from elm—but no *C. difinis*—*Porritia galactodactyla*, from burdock, and *A. nigrofasciaria* and *badiata* from rose. All these were common, but the two most conspicuous of all larvæ were *Malacosoma neustria* and *Porthesia similis*. *Neustria* was on everything and crawling all over the roads, and later on I was surprised to find its cocoons spun up in the heather in quite considerable numbers.

Panolis piniperda was nearly as common on the pines, and on the only morning we beat for them seriously we got as many as we wanted in ten minutes, eight or ten falling at every beat.

The way the oaks recovered after the Spring larvæ had pupated was remarkable. It really seemed as if they only waited for the last *viridana* to pupate before commencing to put forth new leaves. By the middle of July there was such beautiful foliage as is rarely seen in Spring—the new leaves large and fresh and quite untouched by insect attacks. In fact, I fear that all late oak-feeding larvæ—those that would have been small or half-grown at the end of May—must have fared very badly. As to *viridana* itself, vast numbers survived, as the clouds of moths in early July testified; treacle patches of the previous night being covered with them long before dusk. The woods at this time were remarkably fresh and beautiful, as, in addition to the glorious foliage of the trees, the undergrowth was distinctly fuller and richer than usual, probably owing to the fact that the bareness of the trees in May and June had allowed the air and sunlight to penetrate more freely.

But I am again running ahead and must go back to June 1st, on which day I discovered the possibilities of the fence on the Leatherhead Road. After this we visited it on most days. It is about a mile long and sheltered with over-hanging trees—mostly oaks and poplars. One of the regular species was *Lobophora hexapterata*, but we nearly always filled a lot of boxes with something useful, and among many other species it produced I would mention some fine *Hadena genistæ*, *Dipterygia scabriuscula*, *Erastris fusculea*, *Acronyeta leporina*, *Zonosoma pendularia* (including one nice banded form), *Z. punctaria*, *Asthena luteata*, *Acidalia trigeminata*, *Tephrosia extersaria*, *Amphidasis strataria* (a dead female in a crevice), *Eurymene dolabraria*, *Cidaria silaceata*, *Anaitis plagiata*, *Eupithecia rectangulata* (the typical green form), *E. exigua* and *E. dodoneata*, the last named not uncommonly on a few yards of the fence only.

During the month many odd things were picked up in other ways. *Smerinthus ocellatus* and *Amorpha populi* were found at rest, *Cucullia umbratica* on posts, *Myelophila cribrum* on thistle heads and *Phycis fusca* on the heath.

Here also *Pempelia palumbella*, *Aspilates strigillaria*, *Lycophotia strigula*, and *Plebeius aegon* became very abundant in due course, and *Anarta myrtilli* seemed to have discovered the secret of perpetual youth. At any rate after its first appearance one could rely upon taking fresh specimens any day until the end of our visit on July 16th.

From the similar nature of the locality, I had expected *P. aegon* to be small and dull as in the New Forest, but on the contrary the race is a very bright one. Some of the males almost equal in size and brilliance the Kentish chalkdown race, although of course without the characteristic pale underside of the latter form. The females were not well out, but the few I saw were larger and with a greater tendency to blue scaling than those from the New Forest.

Whenever we were on the heath, we gave some attention to *Bupalus piniaria*, which is another long-lived species. I took two specimens back in 1896 of a very nice dark form, with the white (or yellow) much reduced on the upper surface and having a striking underside. In this all the dark speckling is absent and the longitudinal yellow streak on the hindwings stands out boldly on a clear chocolate ground. I was exceedingly interested to find this form again—very local and in almost exactly the old spot. We took four only—the first two on one day by my youngest seven-year-old boy while I was away in town. He at once recognised that they were varieties (for which he has keen eyes). These two and two more taken later varied in some degree on the upper side, but the under-sides were identical and it seems to be a distinct recurrent form.

I was away at Brighton during the fourth week in June, and during my absence *Eltopia fasciaria* and *Diacrisia russula* appeared and a nice varied series of the former was taken from pine-trunks during July.

Other captures during the week included *Hylophila bicolorana* at rest on the heather, several *Lithosia mesomella*, flying into the late afternoon and *Tethea subtusa* on a fence. But the great change that had taken place in my absence was the sudden attractiveness of treacle, without any apparent change in conditions of weather or temperature. We had persisted steadily since June 4th, and the record night until June 28th was four moths. On this night and for a fortnight moths swarmed on our round in Steer Lane, and continued to do so until July 13th, when there was a marked falling off, and by July 15th we were back again to the early conditions of one or two moths only.

In the festive period however we had a great time, taking thirty-four species—many of them in great numbers. I think the commonest of all was *Alpecta nebulosa* and others were *Thyatira batis* and *T. derasa* of course, numbers of *Xylophasia hepatica* in lovely condition *Dipterygia scabriuscula* very commonly on one night only, *Manestra anceps*, *Erastria fuscula*, *Aplecta herbida*, *Craniophora ligustri*, *Boarmia roboraria*, and *Rhodophaea tumidella*. My boy was very keen on getting *roboraria*, and after missing the first specimen I felt it

prudent to prevaricate on missing the second also, and suggested that it might have been *repandata*. However a successful encounter with a third specimen on the next tree settled matters more happily and we went home rejoicing.

In our treacling effort we had to face the competition of other Entomologists in the shape of dormice. Several of these beautiful little creatures were observed in the lamplight, sitting on small branches of the trees and well placed for making many captures.

The decline of "treacle" unfortunately coincided with the emergence of my *Calymnia pyralina* pupæ, and another week might have given me a fine lot of this species, as the larvæ had been quite common.

As it was I did not capture a specimen at large.

We had really big bags on those treacling nights, as at the same time dusking was exceedingly good down Steer Lane. As I said before, it quite recalled the wonderful numbers we used to get at Chattenden in the 'nineties,' and many of the species were the same. There were the old quantities of *Cidaria fulvata* and *Melanthia bicolorata* as a back ground, plenty of *Hepialus hectus*, *Angerona prunaria*, and *Euchloris pustulata*, and fair pickings of other things, such as *Timandra amataria*, *Melanthia albicillata*, *Melanippe unangulata*, *Cidaria silaceata*, *Pericallia syringaria*, *Metrocampa margaritaria*, and *Chortodes arcuosa*. I was much struck with the very small proportion of banded forms of *prunaria* and as usual *pustulata* seemed to be born "tired." It is like *Tapinostola hellmanni* at Wicken in this respect and seems to arrive in a faded and fringeless condition. It appeared slowly and in increasing numbers, yet we did not take a single good specimen.

Hemithea aestivaria on the other hand was in the pink, or rather the green, of condition.

But these good times were nearing their end and on July 16th I made my last capture during a final walk through the pines on my way to the station. It was a fine *Acronycta leporina* of a striking form—just out, in spite of the date. The ground colour is a clean creamy white with no grey powdering and the usual markings clearly defined and black. In fact at a short distance I thought it was *Spilosoma menthastri*. I have no doubt had we been able to work light, we should have considerably added to our captures as we were most favorably situated for "indoor light," but in these days of Zeppelins such a thing could not be allowed. In spite of this lack however we turned up in all 270 species to the end of the plumes. And although this total includes no late summer or autumn species it could no doubt be considerably augmented. In fact I myself have taken seven species in former years during the same months, that we failed to find in 1916.

These were *Calligenia miniata*, *Eucosmia undulata*, *Acidalia subsericeata*, *Lobophora sexalisata*, *Urambus pinellus*, *Rivula sericealis* and *Dioryctria abietella*.

But as it stands it is a goodly total for less than four months' rather casual work in a locality only seventeen miles from the centre of London.

I append a full list of species noted.

- Pieris brassicae.*
 „ *rapae.*
 „ *napi.*
Euchloë cardamines.
Gonepteryx rhamni.
Brenthis euphrosyne.
Aglais urticae.
Vanessa io.
Pyrameis atalanta.
Pararge megera.
Epinephele jurtina.
Coenonympha pamphilus.
Aphantopus hyperantus.
Bithys quercus (lar.).
Callophrys rubi.
Rumicia phlaeas.
Plebeius aegon.
Polyommatus icarus.
Celastrina argiolus.
Hanearis lucina.
Hesperia malvae.
Nisoniades tages.
Angiades sylvanus.
Smerinthus ocellatus.
Amorpha populi.
Hemaris fuciformis.
Hylophila prasinana.
 „ *quercana.*
Nola cucullatella (lar.).
 „ *cristulalis.*
Lithosia mesomella.
 „ *aureola.*
Hypocrita jacobaeae.
Diacrisia russula.
Arctia caia (lar.).
Spilosoma mendica.
 „ *lubricipeda.*
 „ *menthastri.*
Hepialus humuli.
 „ *lupulinus.*
 „ *hectus.*
Porthesia auriflua.
Psilura monacha (lar.).
Dasychira pudibunda.
Orgyia antiqua (lar.).
Malacosoma neustria (lar.).
Macrothylacia rubi.
Saturnia pavonia.
Drepana lacertinaria.
 „ *falcataria.*
- Drepana hamula.*
 „ *cultraria.*
Dicranura vinula.
Lophopteryx camelina.
Pygaera bucephala.
Thyatira devasa.
 „ *batis.*
Cymatophora duplicaris (lar.).
Asphalia diluta.
 „ *flavicornis.*
 „ *ridens (lar.).*
Triaena psi.
Acronycta leporina.
 „ *megacephala.*
Apatela aceris.
Bisulcia ligustri.
Diloba caeruleocephala.
Leucania lithargyria.
 „ *comma.*
 „ *pallens.*
 „ *impura.*
Petilampa arcuosa.
Xylophasia lithoxylea.
 „ *polyodon.*
 „ *hepatica.*
Dipterygia pinastri.
Mamestra anceps.
 „ *brassicae.*
 „ *persicariae.*
Apamea basilinea.
 „ *gemina.*
 „ *oculea.*
Miana strigilis.
 „ *fasciuncula.*
Grammesia trigrammica.
Caradrina morpheus.
 „ *alsines.*
 „ *blanda.*
 „ *cubicularis.*
Rusina tenebrosa.
Agrotis puta.
 „ *segetum.*
 „ *exclamationis.*
 „ *agathina (lar.).*
Scotophila strigula.
Graphiphora angur.
Noctua plecta.
 „ *c-nigrum.*
 „ *triangulum.*
 „ *brunnea.*

Noctua festiva.
Tryphaena ianthina (lar.).
 " *orbona* (lar.).
Amphipyra pyramidea.
Naenia typica.
Panolis piniperda.
Pachnobia rubricosa.
Taenioecampa gothica.
 " *incerta.*
 " *opima.*
 " *populeti* (lar.).
 " *stabilis.*
 " *gracilis.*
 " *miniosa.*
 " *munda.*
 " *pulverulenta.*
Orrhodia raccinii.
Scopelosoma satellitia.
Citria fulvago (lar.).
Calymnia trapezina (lar.).
 " *pyralina* (lar.).
 " *affinis* (lar.).
Miselia oxyacanthae.
Euplexia lucipara.
Phlogophora meticulosa.
Aplecta herbida.
 " *nebulosa.*
Hadena dentina.
 " *oleracea.*
 " *thalassina.*
 " *genistae.*
Cucullia umbratica.
Gonoptera libatrix.
Plusia chrysitis.
 " *gamma.*
Anarta myrtilli.
Heliaca tenebrata.
Erastria fuscula.
Phytometra aenea.
Euclidia mi.
 " *glyphica.*
Zanclognatha grisealis.
 " *tarsipemalis.*
Pechypogon barbalis.
Hypena rostralis.
 " *proboscidalis.*
Brephos parthenias.
Rumia crataegata.
Venilia maculata.
Angerona prunaria.

Ellopia fasciaria.
Eurymene dolabraria.
Pericallia syringaria.
Selenia illunaria.
Emmoma angularia (lar.).
Himera pennaria (lar.).
Phigalia pedaria (lar.).
Amphilasys strataria.
Hemerophila abruptaria.
Boarmia repandata.
 " *rhomboidaria.*
 " *roboraria.*
 " *consortaria.*
Tephrosia consonaria.
 " *bistortata.*
 " *crepuscularia.*
 " *extersaria.*
 " *punctulata.*
Pseudoterpna cytisaria.
Phorodesma pustulata.
Iodis lactearia.
Hemithea strigata.
Zonosoma punctaria.
 " *trilinearia.*
 " *penulularia.*
Asthena luteata.
 " *candidata.*
Eupisteria heparata.
Acidalia scutulata.
 " *bisetata.*
 " *trigeminata.*
 " *remutaria.*
 " *arersata.*
Timandra amataria.
Cabera pusaria.
 " *exanthemaria.*
Bapta temerata.
Semiothisa liturata.
Strenia clathrata.
Panagra petrararia.
Scodiona belgiaria.
Ematurga atomaria.
Bupalus piniaria.
Aspilates strigillaria.
Abraxas grossulariata.
Lomaspilis marginata.
Pachylenemia hippocastanaria.
Hybernia rupicaprararia (lar.).
 " *leucopheararia* (lar.).
 " *aurantiaria* (lar.).

Hybernia marginaria.
 „ *defoliaria* (lar.)
Anisopteryx aescularia
Cheimatobia brumata.
Oporabia dilutata.
Larentia multistrigaria.
Eupithecia centaureata.
 „ *castigata.*
 „ *pusillata.*
 „ *indigata.*
 „ *nanata.*
 „ *vulgata.*
 „ *assimilata.*
 „ *lariciata.*
 „ *dodoncata.*
 „ *exiguata.*
 „ *pumilata.*
 „ *coronata.*
 „ *rectangulata.*
Lobophora hexapterata.
 „ *carpinata.*
Thera obeliscata.
 „ *firnata* (lar.).
Hypsipetes elutata (lar.).
Melanthia rubiginata.
 „ *ocellata.*
 „ *albicillata.*
Melanippe unangulata.
 „ *sociata.*
 „ *montanata.*
 „ *fluctuata.*
Anticlea derivata.
 „ *badiata.*
Camptogramma bilineata.
Cidaria corylata.

Cidaria russata.
 „ *silaceata.*
 „ *fulvata.*
 „ *associata.*
Eubolia mensuraria.
 „ *palumbaria.*
Anaitis plagiata.
Scoparia ambiguaalis.
 „ *dubitalis.*
 „ *truncicolella.*
Pyrausta purpuralis.
Herbula cespitalis.
Endotricha flammealis.
Eurrhypara urticata.
Scopula olivalis.
 „ *prunalis.*
Botys ruralis.
 „ *fuscalis.*
Ebulea crocealis.
Pionea forficalis.
Cataclysta lemnata.
Stenoptilia pterodactyla.
Emmelina monodactyla.
Porritia galactodactyla.
Alucita hexadactyla.
Crambus pratellus.
 „ *pascuellus.*
 „ *perlellus.*
 „ *tristellus.*
 „ *inquinatellus.*
 „ *hortuellus.*
Myelophila cribrum.
Phycis fusca.
Rhodophaea tumidella.
Pempelia palumbella.

Species marked " (lar.) " were observed only in the larval state.

It will be noticed that many common species, such as *Tryphaena pronuba*, are missing.

REPORT ON THE BIRDS OF EPPING FOREST FOR THE YEAR 1917.

In presenting the Second Annual Report on the Birds of Epping Forest, the Ornithological Committee wish to express their thanks to the members of the Society and friends who have collected records for the Report.

Unfortunately it has been found impossible to make the fullest use of these contributions, which, the Committee is happy to state, have been more numerous than in 1916, as, consequent upon the prevailing paper restrictions and increase in cost of production, drastic condensation has had to be exercised. As a result the Report appears in a new form and smaller type, and much material of interest has had to be omitted.

Following on the plan adopted by the Committee in their first report of designating unnamed ground in the Forest area, where such becomes necessary for the purpose of recording observations, it is proposed to name as *Chingford Wood* that area of the Forest lying immediately to the north of Chingford Plain and bounded on the north by Woodman's Glade, east by the Cuckoo Brook and west by Bury Road.

Communications and records may be sent to the Secretary of the Section, Mr. A. Brown, 44, Ravensdale Road, Stamford Hill, N.16.

JANUARY 6th.—A male and a female Bullfinch in Highams Park, and a Tufted Duck on lake. Numbers of Jackdaws heard. 14th.—(Very cold.) Several Missel Thrushes feeding on berries by the Epping New Road, near the Warren. A Coot on Connaught Water, and several Moorhens feeding on the banks. 28th.—(Very cold and dull.) Three Coots on Connaught Water. Several Hawfinches seen and the Redwing heard; also 2 Missel Thrushes, near "The Warren." Large and small flocks of Lesser Redpolls, feeding on ground under bushes at Strawberry Hill and High Beach. Over 50 Greenfinches and a Redwing feeding on ground at Debden Slade; the latter very tame. Small flocks of Greenfinches amongst high beeches at High Beach and Magpie Hill, and 2 male and 2 female Bullfinches at High Beach. Great Spotted Woodpeckers in Hill Wood. Thirty-four Blackbirds were identified, but not a single Song Thrush. The severe cold seemed to be taking its toll of the birds, one Blackbird being found dead in an emaciated condition, probably from starvation.

FEBRUARY 4th.—(Ground frozen and thinly covered with snow.) The Jay was heard on two occasions, and a male Reed Bunting, with considerable amount of black on head, 2 Fieldfares, and several Hawfinches were seen near "The Warren." Carrion Crow calling near Chingford Plain, and 2 Kestrels over Old Church Plain. 10th.—

(Snow deep in places, but thawing.) The absence of bird life very striking. Great Spotted Woodpecker's note heard repeatedly near High Beach, and a male Reed Bunting, apparently in breeding plumage, rose from the grass on Strawberry Hill. Four Lesser Redpolls under the birches at High Beach. *11th.*—At Fairmead a pair of Carrion Crows were very noisy, and a small flock of Missel Thrushes were feeding on berries. *17th.*—(Milder.) A flock of about 15 Lapwings, many Rooks and Starlings, and a few Larks (one in full song) on Chingford Plain. A small flock of Fieldfares, 2 Reed Buntings, and a Hawfinch, near "The Warren." A number of Jackdaws heard calling at High Beach, and the Tree-creeper was seen, Green Woodpecker heard, and Starlings very vociferous amongst the high beeches. Numbers of Lesser Redpolls under the birches. Two Carrion Crows seen and heard over Old Church Plain and again near Chingford Plain. *25th.*—(Very misty.) The Jay was heard on Chingford Plain. Large or small companies of Lesser Redpolls were seen feeding under birches at High Beach and Loughton Camp. About 30 Blackbirds and about half a dozen Song Thrushes were counted, and some of the latter were singing towards the end of the month. Flocks of Marsh, Coal and Long-tailed Tits were seen on several occasions during the first half of the month, and a few of Great Tits and Chaffinches. During the month the "see-saw" note of the Great Tit was heard several times.

MARCH *3rd.*—Green Woodpecker repeatedly calling at Broad Strood, and Jackdaws noisy. Tree-creeper seen. *4th.*—(Weather very cold, but bright.) Nine Pochards (both sexes) on Connaught Water. Several Hawfinches and a pair of Bullfinches near "The Warren." Tree-creeper in Long Hills. Wood very silent. *11th.*—A Coot, male Tufted Duck and female Pochard on Connaught Water, and Chaffinch singing well—a month later than in 1916; Hedge Sparrow singing near the "Red Path," and a female Reed Bunting rose from the grass near "The Warren." Hawfinches again noted. Nuthatch calling on Old Church Plain. *17th.*—(Weather delightfully springlike.) Kingfisher flying over lake, and a party of about 30 Siskins feeding on the alders in Highams Park. Missel Thrush and Greenfinch singing, but latter not quite full. About 40 Starlings feeding in flock on Hatch Plain, some with bills in full breeding colour. Two Bullfinches (one a male) and Carrion Crow seen near Whitehall Lane, and a Kestrel working the plain near. Nine Tufted Ducks, 1 Coot, and 4 female Pochards on Connaught Water. A Gold-crest at Buttonseed Corner and a Carrion Crow at Fairmead. A small party of Lesser Redpolls in St. Thomas's Quarters. Parties of Rooks noted about 6.30 p.m. in trees on Mount Pleasant. This would appear to be a regular occurrence. Tawny Owl hooting at Fairmead. *18th.*—(Still springlike.) Eight Tufted Ducks and 3 Pochards on Connaught Water. A Meadow Pipit and a Hawfinch noted near "The Warren," and a Green Woodpecker on Strawberry Hill. A flock of about 25 Meadow Pits on Fairmead Bottom, and a number of marble galls wedged in birch trunks in Little Monk Wood, and broken open, was probably the work of a Nuthatch. *24th.*—(Weather bright, but very cold.) Rooks very active in Wan-

stead Park and the Jackdaw heard. Herons seen at the nests. 25th.—(Cold and misty with rising temperature.) Two Meadow Pipits (evidently paired) near the "Red Path." Green Woodpecker, 2 more Meadow Pipits and a Goldfinch near "The Warren"; also a male Bullfinch piping as he flew. Two more Bullfinches (one a male) seen, a Missel Thrush singing, and a Jackdaw heard on Staples Hill. Mallard flushed from ditch on Fairmead and also from Cuckoo Pits (three times).

During the month large or small flocks of Titmice, Chaffinches (males in brilliant plumage, on 17th, and mating evidently in progress), and Greenfinches were seen on several occasions, and from the 11th onwards Chaffinches, Thrushes, Robins, Hedge Sparrows, and Great and Blue Tits were singing freely; 21 Jays and 10 Blackbirds were seen. A Forest keeper near Cuckoo Pits said Blackbirds had suffered severely during the frost, as many as 30 dead being found in a morning. He said that the Blackbird does not leave the Forest so readily as other birds in severe weather.

APRIL 1st.—(Violent snowstorm throughout morning; bright but cold in the afternoon.) Kingfisher flying over Highams Park Lake. Green Woodpecker heard at Whitehall Plain and Fairmead Bottom. Birdlife remarkably scarce. 8th.—(Misty and milder, but some snow still about.) About 12 Siskins feeding on alders, and a Tree-creeper seen in Highams Park. On Hatch Plain 2 Bullfinches (1 male) and a Tree-creeper. Missel Thrush heard near Whitehall Plain, and a Green Woodpecker there, and another at Buttonseed Corner. Hawfinch on two occasions near "The Warren." About a dozen Carrion Crows were seen and much song, including the Wren's (previously remarkably silent), was heard. 9th.—(Cold N.W. wind with heavy snowsqualls and a few bright intervals.) Pair of Carrion Crows, evidently nesting, as usual, on eastern edge of Chingford Plain. A dead Redwing, much decomposed, at Magpie Hill. A Lapwing flying over, a few Mallards and Moorhens on, and a Pied Wagtail near the edge of, Connaught Water. Green Woodpecker heard twice at Broad Strood. Very little song heard—mostly Chaffinch and Great Tit with occasional Robin. 22nd.—Tawny Owl near Cuckoo Brook and another in Bury Wood. The first on a branch 40 feet from the ground, dropped over half that distance in starting flight; the other was high up on a slender branch of a spreading tree, its usual habit. Tawny Owls generally spend the day in hollies in the Forest (J.R.). 27th.—Willow Warbler heard on Whitehall Plain. Cuckoo and Swallow at Chingford. 28th.—Willow Warbler in Hawk Wood. 29th.—(Sunny and pleasant, but strong wind from N.W.) Redstart (male) and Tree-creeper at Cuckoo Pits. Several Tree Pipits singing near golf links, Chingford Plain. The Yellow Buntings, in their usual corner near Yardley Hill, were noted, and 3 Carrion Crows, probably 2 males and a female, as the former were seen to fight, also several Swallows seen, and Willow Warblers plentiful. A Blackcap seen and heard in fair song. Chiffchaff heard in full song at the top of Gillwell Lane. A Nightingale singing near Connaught Water. 30th.—Forest seemed full of Willow Warblers.

During the month occasional flocks of Chaffinches, Greenfinches, and Tits were seen, and a number of Jays and Carrion Crows were identified.

MAY 5th.—(Bright afternoon, but cold with high wind.) In Hawkwood, Greenfinch "cheering." Blackcap heard and seen, Lark in full song and several Ringdoves seen near Gillwell Lane; also Chiffchaff, and at High Beach, Jackdaws passing in and out to their nests (apparently 6 or 8) in High Beach Church tower. Whitethroat singing at edge of Chingford Wood. Tree Pipit in Hawk Wood and on Ludgate Plain, where it settled on four different trees after four flights. A pair of Redstarts and a single male and a single hen seen in Chingford Wood. 6th.—A Magpie seen between Chingford and Loughton. A pair of Redstarts and a single male between High Beach and Wake Valley Pond. 9th.—(Bright evening with chilly wind.) Great Spotted Woodpecker's note heard several times on Ludgate plain, and a pair of Bullfinches seen. Two Jays seen in Chingford Wood—quite silent, also both species of Whitethroat heard. 12th.—Willow Warbler's nest in Chingford Wood—no eggs. Wood Warbler seen and heard near Cuckoo Brook. 13th.—(Brilliant, hot and close.) Turtle Dove at Fairmead, also Tree Pipit on a low bush. By Connaught Water harsh notes of nightingale heard and bird seen, and near Rangers Road Garden Warblers and Blackcaps singing, also a Linnet seen and heard. Song Thrush's nest with three eggs in hawthorn on Fairmead. An old nest of a Tree-creeper at Oak Hill. Ring Dove calling and a Great Spotted Woodpecker "drumming." Near the Wake Arms, Wood Warbler seen and heard. 19th.—(Dull and oppressive, with thunder showers.) Robin feeding fully fledged young in Monk Wood. Carrion Crow's nest at top of large oak to N. of the wood. Near the Wake Arms, 2 Wood Warblers watched; probably a pair. Tawny Owl hooting at 7 p.m., in wood behind the "King's Oak." Jackdaws noisy near the church, and in the birch trees 3 Wood Warblers in full song. A Cuckoo heard calling the first syllable only, and in Hill Wood a Great Spotted Woodpecker "drumming."

During the month Whitethroat, Lesser Whitethroat and Garden Warbler, Nightingale and Chiff-Chaff, were singing freely in many parts of the Forest.

JUNE 2nd.—Flock of about 50 Rooks and Jackdaws very restless in Chingford Wood, flying round and settling repeatedly in the tree-tops when disturbed. 3rd.—(Very hot.) Wood Warbler near Ludgate Plain and near High Beach Church; also Green Woodpecker near the Church. Two Tree-creepers in Chingford Wood. 10th.—Reed Bunting at Fairmead Bottom. Male Redstart, with food in beak, in Chingford Wood. 11th.—Tree Pipit at Yardley Hill. Wood Warbler still at Ludgate Plain. 13th.—Great Spotted Woodpecker's nest near Cuckoo Brook in Chingford Wood. 16th.—(Very hot, with thunder-storm.) Wood Warbler singing in wood between Robin Hood and Staples Hill. 21st.—(Cool evening, but bright.) Great Spotted Woodpecker's nest high up in dead beech, near Woodman's Glade; young

birds heard "chanting," old bird very shy and noisy. Blackcap in good song. Redstarts heard. *23rd.*—Flock of Rooks settling on trees in Chingford Wood in the evening. Wood Warbler at High Beach. *25th.*—Partridge flushed on western side of Chingford Wood. *30th.*—The Great Spotted Woodpeckers, near Woodman's Glade, had left nest. Alarm note of Nightingale heard and bird seen with food in bill. Redbacked Shrike heard on Ludgate Plain, and nest seen near Warren Hill, containing three or four birds, which scrambled away when approached. Wood Warbler heard and seen at Loughton Camp, and 2 nests found (previously under observation); one deserted and the other thought to have been brought off. Nightjar flushed near Turpin's Cave, and watched flying about under trees for some time. Turtle Dove near Fairmead. Alarm notes of Redstart and Willow Warbler common. Young Coal Tits being fed in Chingford Wood. Near Ludgate Plain a young Jay was seen on a tree with its head turned round on back, evidently asleep; an old bird became noisy and it woke up and flew off.

During the month Willow Warblers, Chiffchaffs, Whitethroats, Chaffinches, Blackbirds, Thrushes, Wrens, Tree Pipits, Redstarts, Great Tits, Marsh Tits, Greenfinches, Nightingales, and Cuckoos were singing more or less freely, and Jays and Carrion Crows were seen frequently.

JULY 8th.—(Dull and cold, with much rain.) Willow Warbler's alarm note heard. Plenty of young of Tits and other birds seen. Green Woodpecker and male Redstarts on Old Church Plain. A brood of 5 young pheasants flushed near Woodman's Glade. Lark singing in the rain on Chingford Plain. Tree Pipits in Pear Tree Plain and Fairmead Bottom. *14th.*—(Bright and hot in afternoon.) Spotted Flycatcher, Yellow Bunting, and Pied Wagtail on Warren Hill. Female Pheasant in Monk Wood. Redstart alarm-note common.

AUGUST 5th.—(Dull morning, threatening rain, improving later.) From Strawberry Hill about 30 Lapwings seen flying in flock high over Loughton. Several Linnets flying high up near High Beach Church, and singing in flight. Kestrel (female), on Old Church Plain. Hedge Sparrow and Wren singing and Chaffinch's alarm note heard. Willow Warbler and Great Tits seen in immature plumage. Jays common, but only three Blackbirds seen. *19th.*—Several Spotted Flycatchers (evidently a family) hawking for flies on Old Church Plain. *31st.*—Redstart in Chingford Wood. Whitethroats still singing throughout month.

SEPTEMBER 1st.—(Bright, and air very clear.) Several Spotted Flycatchers—apparently pairs—seen on bushes between High Beach and Epping New Road. A pair of Green Woodpeckers flushed from ground in Long Hills—one "yaffling" loudly. Several Ringdoves seen. Old nest of Tree Pipit found at Loughton Camp. Complete absence of bird song very noticeable. *8th.*—Great Spotted Woodpecker's note heard in Chingford Wood, and bird watched at work under a horizontal

bough. *9th.*—Tawny Owl heard about 11 a.m., between Cuckoo Brook and Blackbush Plain. Turtle Dove, adult and young bird, seen among ash trees near Grimston's Oak. The flight of the Martins, about 6 p.m., over Chingford Plain, thought to be slower, with more beating of the wings and less swoop than usual. Was this due to the moist and heavy atmosphere? *15th.*—(Bright morning.) No Swallows or Martins seen over Chingford Plain, but twittering heard in woodland suggested that they were over the trees. *16th.*—Plenty of bird song heard—especially Redbreast. *29th.*—No Swallows or Martins over Chingford Plain or Connaught Water. Jay heard or seen nine times between Chingford Plain and Fairmead. Later, notes like Tawny Owl's "tu-whit," but only Jays seen. Was it a case of mimicry of the Owl's note by the Jays?

OCTOBER *7th.*—(Cold and wet morning.) By the "Red Path" several Starlings and Thrushes picking at the dogwood berries. Hedge Sparrow singing by Connaught Water. *21st.*—Two Herons flying over Chingford Plain at 11 a.m., E. to W. *27th.*—Family of Long-Tailed Tits at Connaught Water. *28th.*—Marsh Tits at Loughton. Carrion Crows and Jays frequently seen during month.

NOVEMBER *2nd.*—Redwing heard at night at Theydon Bois. *3rd.*—Flock of Wood Pigeons at Yardley Hill, flying high. *17th.*—Two female Mallards and one male on Connaught Water in late afternoon. *18th.*—(Dull and hazy.) Two Hawfinches feeding on field-rose hips at "The Warren"; seeds neatly scooped out, leaving skin. One Goldfinch on a berryless hawthorn, singing. Redwings on hollies near Fairmead; very wild. *25th.*—(Cold and bright, with high wind. Heavy sleet and snow before noon.) Goldfinch seen twice at Fairmead. Redbreast singing and Chaffinch's alarm note heard. A Blue Tit observed diligently pecking at the buds of the slenderest branches of a willow, which on examination proved to be suffering from insect attack. Many Tits (Great, Blue, Coal, Marsh, and Long-tailed) noted, especially towards end of month.

DECEMBER *1st.*—Small flock of Wood Pigeons in Hill Wood, and party of male Chaffinches on Almshouse Plain. *2nd.*—(Cold wind.) Goldfinches at thistles on Yardley Hill, and Greenfinches at field-rose bushes on Chingford Plain. Flock of Starlings on Pole Hill. Lesser Redpolls at alder in Highams Park. *8th.*—Two Gulls (? Blackheaded) on a pond in Wanstead Park. Tree-creeper seen. *9th.*—(Cold and rainy, with N. wind.) Flock of male Chaffinches, Chingford Plain. Male Bullfinch by Red Path. Two Tree-creepers—one uttering its shrill note, Fairmead. Six Mallards on Connaught Water—very wild. Song Thrush singing near lake. Numbers of Blackbirds noted. *15th.*—(Windy.) A Tree-creeper on each side of Chingford Plain, working high up in the trees. *16th.*—Redwings on hollies, near Fairmead; again very wild. Thirteen Mallards on Connaught Water. Bullfinch on Red Path, apparently attacking elder buds. *23rd.*—(Cold and bright morning after frost.) Three Redwings at the haws on Fairmead; still

very wild. Blackbirds and Thrushes also at the berries. A Greenfinch eating field-rose berries, near Buttonseed Corner. Blackbirds plentiful. 24th.—(Dull at first, then brighter.) Three Goldfinches in "The Sale," Hale End, apparently feeding on grass seed. Tree-creepers heard. 29th.—(Heavy, dull afternoon.) Birds very scarce. Rooks clamouring in wood near "King's Oak," p p.m. A flock of Jackdaws flying over Fairmead 6 p.m., and Tawny Owl hooting by "The Warren." 30th.—(Drizzling rain.) Green Woodpecker "yalling" in Hill Wood. Tree-creepers in Bury Wood and Fairmead.

Wanstead Park Heronry.—Mr. F. F. McKenzie reports as follows :—
We counted just 60 Heron's nests in Wanstead Park last spring (1917).
Some of the nests were quite late.

OBITUARY NOTICES.

Captain T. W. Brooke, M.C., 6th Batt. London Regt., the elder son of Mr. T. R. Brooke, of Sewardstone Bury, near Chingford, was once the youngest member of the North London Natural History Society. Born in 1896, he was educated at the Forest School, Woodford; matriculated at London University in 1913, and proceeded to Germany to complete his studies. In the first week of September, 1914, he joined the Public School Brigade, being transferred to the Inns of Court O.T.C. next month. He was gazetted to the London Regt. in March, 1915, and went to the front in May. On September 15th, 1916, he won the Military Cross by his fearless leadership, being the only unwounded officer of his battalion at the end of the attack. He was wounded two days later, and was in England recovering until July, 1917, when he rejoined his battalion. The senior divisional chaplain wrote:—"Your son was wounded and sent to the dressing station, but having had his wounds dressed, and hearing that another counter-attack was impending, he insisted upon returning to his company. I cannot tell you how grieved we all are, and how proud we are, and you will also be, of his wonderful gallantry. I have known your son for a considerable time, and I can say honestly that he was one of the finest boys I have ever met, even out here the men adored him, and rightly so." His Commanding Officer wrote:—"He was a great friend of the regiments, as he was an excellent officer, a brave man, and an English gentleman of the right sort."

By the death of Mr. A. J. Scollick the Society loses a keen lepidopterist, who passed away on May 6th, 1917, in his 60th year, shortly after an operation. Of recent years he had not been a regular attendant at our City meetings, but was generally present at our rambles prior to his removal to Devonshire. He was a very popular member amongst our entomologists owing to his great enthusiasm.

The death of Mr. A. E. Gibb, an ardent lepidopterist, is another loss to the Society. His appearance at our meetings, always with a big exhibit of specimens—of later years those captured on his continental trips—was always a pleasure, and the result of his activities will be missed by every London Society of which he was a member. An extended obituary notice is given in the *Entomologist*, vol. 50, p. 95.

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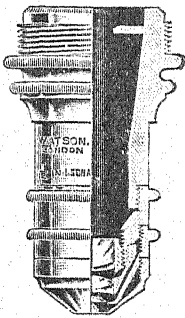
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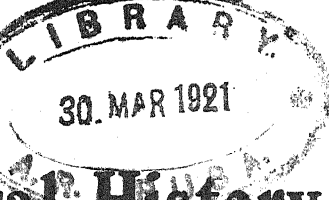
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NOTE.—The following abbreviations are used in the above lists:—Api., Apiculture; Arch., Archaeology; Ast., Astronomy; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Geol., Geology; Hem., Hemiptera; Hym., Hymenoptera; Lep., Lepidoptera; Mam., Mammalia; Micr., Microscopy; Neur., Neuroptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Rep., Reptilia; Zoo., Zoology.

EXTRACTS FROM MINUTES.

(Ornithological communications included in the Epping Forest Diary (see pp. 30 to 37 are omitted.)

January 8th, 1918.—COMMUNICATIONS.—Mr. W. H. Bell recorded having seen on the Lea marshes between Cheshunt and Broxbourne, on December 26th, 1917, several snipe; also an Otter on the bank of a small stream running by the Lea behind a wood of Alders. Mr. Bacot remarked that Otters wander over large tracts of country, and the one seen was probably not a denizen of the place.

Mr. Ross recorded large flocks of Rooks and Jackdaw in North Oxon about Christmas Day last, and mentioned that he had found the Redwings in that district early in the new year much less wild than some he had seen in Epping Forest about January 6th.

PAPER.—Mr. Bacot read a paper on "Mosquitoes and the danger of Malaria in England," illustrating it with lantern slides dealing with the life-history and anatomy of the insects, and showing views of typical breeding places. After discussing the position of mosquitoes in relation to other insects and giving a brief description of the bionomics of the group, he dealt with their connection with the spread of malaria, yellow fever, dengue, and elephantiasis. He explained the distinctions between Culicine and Anopheline mosquitoes, and outlined the history of ague in England, based on articles published by Nuttall, Cobbett and Strangways, in vol. i. of the *Journal of Hygiene*. He next dealt with the possibility of a recrudescence of ague in England, owing to the return of soldiers who had contracted malaria abroad, and called attention to the need of considering the interaction of the natural enemies of mosquitoes before carrying out any campaign for the destruction of the latter. On the motion of Messrs. Hall and Ross Mr. Bacot was heartily thanked for his instructive paper.

February 5th.—COMMUNICATIONS.—Mr. Ross reported that the snows of January 16th-17th were the cause of much damage to trees in Epping Forest. Possibly wind had played some part in the havoc, but the snow had been the chief factor. Many "spears" of pollarded hornbeams had been broken down by its weight, and some crabs and hawthorns had suffered, but the greatest damage had been done to the birches, which from their growth of small twigs had held the wet snow more. The tops of many young birches were snapped off or fractured and broken over, and the higher branches of some of the older trees were injured in the same way. The stem of the tree in which was the greater spotted Woodpecker's nest reported last year in Chingford Wood had been broken over.

ANNUAL POCKET-BOX EXHIBITION.—Mr. C. H. Williams: long series

of selected varieties and aberrations of *Agriades coridon* from Dover, Folkestone, Royston, Dunstable, Prince's Risborough, and Alton; also, on behalf of Mr. W. E. King, two specimens of *Brenthis euphrosyne* with extremely dark borders, one bleached specimen of *Epinephele jurtina* (*janira*), two asymmetrical *Polyommatus icarus*, the left wings in both cases being indented at the apex. Mr. Shaw: aberrations of *Rumicia phlaeas* including the abs. *major*, *suffusa*, *obsoleta*, and *radiata* of Tutt, *caeruleopunctata*, Stgr., and others. Mr. Riches, on behalf of Mr. W. Southey: a series of *Agriades coridon* from Dunstable (August 15th, 1917), including one ab. *obsoleta*. Mr. Newman: *Abraeus grossulariata* from many localities including vars. *deleta* (*lacticolor*), *nigrosarsata*, *lutea*, *flavipallidata*, *centralipunctata*, and a number of examples of var. *variegata*, including white-rayed forms and forms in which the white on the "shoulders" of the forewings was almost obliterated. *Boarmia roboraria*, showing remarkable variation in size, the smallest being not much larger than *Tephrosia punctularia*; the larvæ had been sleeved on oak. A pair of melanic examples of *B. consortaria* from Sutton Coldfield. A series of *Dicranura bicuspis* and a dark-banded form of *Agriopis aprilina*. Also, on behalf of Mr. G. B. Oliver: selected forms of *Agriades coridon* var. *syngrapha* with broad and narrow borders and some minor aberrations, the specimens showing four distinct shades of colour, viz.: pale blue, dark blue, greenish-blue, and dull metallic blue, and including an asymmetrical specimen with khaki streaks on the right wings; also var. *semisyngrapha* with hindwings mostly blue; an underside with hindwings showing obsolete spotting; a gynandrous specimen; males showing colour variations, some dark blue and others varying between the type and var. *fowleri*; undersides of both sexes including vars. *obsoleta*, *semi-obsoleta*, *striata*, and *striata-obsoleta*. Mr. Pickett: a long series of *Agriades coridon* from Hertfordshire (August, 1917). Males—ranging from silvery blue to *adonis* blue, with many ab. *suffusa* and one ab. *marginata* with the blue well suffused and deep bands running round all the wings; two ab. *minor*; one of a lilac blue; three very dark on the underside (approaching the female), with very large spots, and two with pure white ground colour with the spotting only faintly suggested. Females—(uppersides) colour ranging from khaki through various shades of slaty grey to intense black; three specimens with all the the wings unicolorous black; several specimens with khaki-coloured patches; many with deep red lunules on hindwings, and several with the red lunules extending round the forewings; one with the lunules yellow; several ab. *minor*; many ab. *semisyngrapha* approaching *syngrapha* (of which he showed a series from the Chiltern Hills for comparison); one remarkable specimen with right wings of the normal plain brown of the female, and left wings of a blue shade, approaching that of *adonis*, with a faint suggestion of black spots round the border, the wings being smaller than those in the right (coming under the *roystonensis* type), like a glorified *syngrapha* without the border; a long series of *roystonensis* (none crippled) all with the smaller wings and well dusted with blue (male *androconia*). Undersides—several perfect *obsoleta*; one with pure white ground colour and blind

brownish-red borders; one of a grey shade; two of a warm greyish-brown; several cinnamon brown; three blackish-brown; three approaching the male in colouration; several ab. *striata*; one specially dark with spots well-developed into lines; one with extra spotting on the forewings, and two with the usual markings on three wings and the fourth spotless.

March 5th.—EXHIBITS.—Mr. Cooper: a series of *Hibernia defoliaria* taken and bred from Epping Forest in 1913, 1916, and 1917; he remarked on the increase of melanism in this species of recent years.

COMMUNICATIONS.—Mr. Cooper recorded a male *Apocheima hispidaria* in Epping Forest on February 23rd last. Mr. Burkill: an *Aglais urticae* on the wing at Chiswick, on February 24th.

PAPER.—Mr. Hall gave an account of some plants found by him in West Sussex, chiefly from the district round Amberley and Chichester, during 1917, illustrating his remarks with specimens of some of the rarer and more interesting species, including *Papaver lecoqii*, *Astragalus glycyphyllos*, *Lathyrus aphaca*, *Lonicera xylosteum*, *Galium asperum*, *Valeriana mikanii*, *Verbascum lychnitis*, *Wolffia arrhiza*, *Alopecurus bulbosus*, and *Polypogon monspeliensis*. After discussing the special features of the anatomy of the various species, he dealt with some points of plant physiology, basing his remarks principally on *Wolffia arrhiza*, which he was growing for purposes of observation. This species, the smallest known flowering plant, hibernates by means of winter fronds, which, owing to an increased deposition of starch in them, fall to the bottom of the water and there pass the winter. Specimens of both summer and winter fronds were shown, and the remarks based on this species dealt with the selection and absorption of food materials, and their conversion into starch and other components of plant bodies.

April 9th.—COMMUNICATIONS.—Mr. Austin recorded a flock of about two dozen magpies at Kirkstall, Yorks, and near the same place a pair of corn buntings, on March 29th last. Mr. Ross reported that Mr. E. R. Spragg had heard a yellow hammer singing on Woodford golf links, on March 16th, and that blackthorn was seen in flower at Chingford, on March 23rd; a grass snake, at Cuckoo Pitts, on March 24th.

EXHIBITS.—Mr. Ross showed photo-micrographs of (1) Prothallium of fern (*Lastrea dilatata*) with young plant about to uncure, and (2) the same, with a plant having three young leaves. (3) Thalloid protonema of the moss *Tetraphis pellucida*, (4) the same, with a young plant, and (5) with an older plant. (6) Young gemmiferous plants of the moss *Aulaacomnium androgynum*, growing from an old stem of the moss. (7) Young liverwort, probably *Lophocolea heterophylla*, growing from a leaf fragment. (8) Branch of *Ptilidium pulcherrimum*, a liverwort, (9) leaf of same. (10) Moss leaf (? *Mnium* sp.) from the so-called "Arctic bed" found at Ponder's End by Mr. S. H. Warren; the deposit belongs to the close of the pleistocene period, and is later than the period of the River-drift man.

May 7th.—EXHIBITS.—Mr. Ross, a sprig of hornbeam (*Carpinus betulus*) showing old fruit stalks and this year's male catkins. He stated that some botanists say that this species is monoecious and some that it is imperfectly dioecious. Investigations along certain rides in Epping Forest showed that in the autumn of 1917 about 68% of the 119 mature trees observed had abundant or a considerable amount of fruit, whilst in the spring of 1918 66% of 104 trees, along the same rides, had an abundance, or considerable amount, of male catkins.

COMMUNICATIONS.—Mr. Austin, a female Redstart at Stamford Hill, on April 13th. Mr. Hanson, Cuckoo in Eversleigh Park Road, Enfield (April 27th); House Martin, Bush Hill (April 28th); two Swallows, Carterhatch Lane, Enfield (April 29th); Tree Pipit, Winchmore Hill Railway bank (May 2nd); two Nightingales, Winchmore Hill Woods (May 4th).

LECTURE.—Mr. F. J. Stubbs, Curator of Stepney Borough Museums, lectured on "Migration," and the substance of his lecture will be found on pp. 24 to 29.

June 4th.—EXHIBITS.—Mr. C. Nicholson: Larvæ, pupæ, and cocoons of *Plusia moneta* from his garden at Hale End. He remarked that he had found this species exceptionally common in the garden this year, and one cocoon had evidently been torn open and the pupa extracted by a bird, probably a Blue Tit, which had been seen lurking about in a suspicious manner where the cocoon was found.

COMMUNICATIONS.—Mr. Ross reported the oaks in Epping Forest were infested with larvæ on May 25th and 26th and parties of rooks and jackdaws were very restless and noisy about the tops of the trees apparently attracted by the larvæ. Mr. Hall recorded *Carrus strigosa* from near Wormley, Herts., and exhibited a specimen. Mr. Robbins reported the cuckoo as extremely abundant at Limsfield this year.

PAPER.—Mr. C. Nicholson read "Some Entomological Notes from Gloucestershire," covering a period of five summer holidays in the Stroud District in the years 1912 to 1916. The paper having appeared in substance in the *Entomologists' Monthly Magazine* for May, 1917, a copy has been deposited in the Society's library, and further comment is therefore unnecessary, except to record that Mr. Nicholson exhibited a small collection of insects of various orders in illustration of his paper.

September 3rd.—EXHIBITS.—Mr. A. W. Mera: *Argynnis aglaia* and *Hyria auroraria* from Surrey, and remarked that some of the *aglaia* were taken on marshland, whilst previously he had taken that species only on top of the downs. [Both *aglaia* and *adippe* occur in boggy spots in the New Forest, and are fond of visiting the flowers of the marsh plume thistle (*C. palustris*).—C.N.] Mr. C. H. Williams, a fine collection of *Agriades coridon* taken at Prince's Risborough, on August 18th last, including a male entirely dark grey without any blue tint.

COMMUNICATION.—Mr. Hall recorded a larva of *Stauropus fagi* on birch (*B. pubescens*) instead of beech, at Wormley, and mentioned that it was resting on a twig. Mr. Austin read some notes of a holiday

spent at Wensleydale, Yorks., from August 9th to 19th last. The Wheatear and Willow Warbler were common, and half a dozen Redstarts were seen, but only one Dipper. The Pied Wagtail was not frequent, but many Yellow Wagtails were seen, all being birds of the year with the plumage not quite adult. Meadow Pipits and Sand Martins were common; Chaffinches and Starlings in large flocks; Magpies not frequent; Jackdaws and Rooks common. Several Kestrels and Herons were seen, and Mallards came down to the river; all these were birds of the year. Red Grouse seemed common but were said to be scarce owing to disease. There were a few Common Snipe on the river, and the Common Curlew was in parties of four and five, but not in great numbers. The Black-headed Gull occurred solitarily. Possibly a Bittern was seen, but this turned on the question of plumage, there being just a chance that it was a young Heron.

October 1st.—EXHIBITS.—Mr. Ross: specimens of Mycetoza, viz.: *Cribraria argillacea* and *C. aurantiaca* on oak, and *Dictydium cancellatum* on hornbeam, and mentioned that these species are usually found on coniferous wood; also some old sporangia of *Craterium minutum* on the female inflorescence of a liverwort *Marchantia polymorpha*.

LECTURE.—Mr. R. Paulson, F.L.S., lectured on "Lichens," illustrating his remarks with a fine series of lantern slides, some of which showed how some insects were coloured in a way that protected them on lichen-covered trees, rocks, walls, etc.

Mr. Paulson said that it had been stated that Middlesex is the poorest county in the British Isles when we considered the number of lichens growing within its borders, and that Hertfordshire is a good second. There are good reasons why lichens in the immediate neighbourhood of a large town should be scarce; they had been described as creatures of light, and had been said not to tolerate any impurity in the atmosphere. Middlesex and Herts are certainly poor counties for lichens, but not so poor as the statement would lead one to suppose. If a radius of twenty miles from Charing Cross is taken the number is not so small, there being at least 180 good species within that radius—one-tenth of the number to be found in the British Isles. Lichens might seem scarce in woods and on commons in the environs of London, but that might be because they are inconspicuous. We had no great sheets of lungwort such as grew in pine woods in the mountains, and we had no sheets of reindeer moss. The lichens we have, though inconspicuous, are, some of them, distinctly beautiful, and within fifteen miles of the centre of London, there are a number of lichens that appear merely as stains on flints.

Lichens are amongst the foremost of the pioneers of the vegetable world. When a rock that has hitherto been barren shows signs of colonisation by vegetable life it frequently happens that lichens are amongst the first signs of vegetation. These would be of the crustaceous or crustose form, which in its earliest stages is a mere film. After that another form follows, which has a leafy appearance—the

foliaceous or foliose form. The third form was the fruticose form. All these forms were represented within the twenty mile radius. There was a regular progression of vegetation on newly exposed soil that had hitherto been barren, and on rock that had been exposed by the fall of a cliff or other movement.

Whatever may be its shape and appearance a lichen consists merely of a cellular structure. The family is included in the group of cryptogams known as the Thallophyta. Dr. Farrow has been working out the ecology of some heaths near Tuddenham, in Norfolk, where the rabbit was extremely vigorous, and where there has been retrogression of plant life instead of progression. First of all shrubs began to disappear; then the heather was attacked and killed, and then the grass. After the heather and grass had been killed, lichens began to appear, but in the opposite order, first the foliose and then the crustose; then these disappeared, and left the barren sand.

Lichens are also classified according to the substratum on which they grow; those growing on rocks are called saxicole, on wood, lignicole, and those on earth, terricole.

A lichen not known to science before February, 1910, was then found in Surrey by Mr. Starling. In November of the following year he had the good fortune to find it in Epping Forest. Though we have but a small number of lichens within the twenty miles radius, it is possible to find this one, which, so far as he knew, has only been found in these two localities. The species formed a web of green thread-like bodies on the soil, and was known as *Gongylia viridis*.

Lichens are dual organisms, and consist of two plants—an alga and a fungus—growing in close relationship. Investigations show that the growth of lichens is encouraged by light, and that while the south-west side of trees is often covered, the north-east side is bare.

There is a notion that lichens live to a great age and grow at a slow rate, but there are a number that must grow fairly rapidly, in proof of which Mr. Paulson showed lichens in fruit on fir cones, on the bone of a sheep, on the bark of a plane tree, and on rabbit pellets.

Mr. A. Bacot proposed a vote of thanks to Mr. Paulson, and suggested that the disappearance of some species of insects from the London district, and the appearance of melanism in the geometrids and other moths, are due to the disappearance of lichens from trees in the London area.

Mr. Ross seconded the vote.

Mr. Robbins, supporting the vote, suggested that the deficiency of light is more harmful to plant life than impure atmosphere, and is a much greater factor than we have been accustomed to think.

Mr. Paulson, replying to questions and observations, said that the lichen flora of Epping Forest is undoubtedly regaining what it had lost. There is no doubt that many lichens which were disappearing, and many which struggled on, never bearing fruit, were now found in a healthy state. The Smoke Abatement Act must have lessened the smoke that drifted over London, and must have had effect in reviving the lichen flora. As to the intensity of the light, there is no doubt at all that lichens do best where there is a large amount of light; merely

taking the light away by increasing the smoke and fog would tend to make the lichen growth less luxuriant. It is very likely that the insects that had disappeared will return as the lichens do. By the Smoke Abatement Act we got rid of some of the smoke, but we have not got rid of sulphuric acid, which lessens the vigor of, if it does not actually destroy, many of the cryptogams. The lichen flora that has been so much rejuvenated in Epping Forest, is the ground flora, not the tree flora. Possibly, as rain water trickles slowly down the tree trunks the plants are washed with water containing sulphuric acid. With regard to the condition of the lichen flora in districts round London, he had come to the conclusion that the trunk of the tree was not always the greatest factor, for the edaphic (soil) conditions produce differences in the humidity of the atmosphere, and thus greatly affect growth. The lichen flora is much more sparse on dry soil where we get *Quercus pedunculata* than where we get *Q. sessiliflora*, and he believed that the soil has much to do with it. On sandy soil in Surrey lichens are more abundant and luxuriant—in numbers, but not in species.

November 5th.—EXHIBITS.—Mr. Ross: jaws and other remains of Short-tailed Field Vole, recovered from pellets of the Tawny Owl near Cuckoo Brook, Epping Forest, on 2nd inst.; also similar remains containing wingcases of beetles recovered from pellets found in May last.

COMMUNICATIONS.—Mr. Ross, on behalf of Mr. C. Nicholson, recorded the occurrence of the Coccid, *Aspidiotus zonatus* in Lords Bushes, Epping Forest; Mr. J. W. H. Harrison, who identified the insect, says it is rare in the north. Mr. Hanson said the latest date he had observed the Swallow was October 20th (at Winchmore Hill), and on the same day the House Martin (at Chingford); he again saw the Kingfisher on the New River at Bush Hill Park, on October 20th, and on the same day eight gulls flying over the Forest.

PAPER.—Mr. H. B. Williams, who was on service in Ireland, contributed "Random Notes from North-east Ireland," which were read on his behalf by Mr. Shaw. These notes have been published in the *Entomologist's Record* (May 15th, 1919, pp. 53 to 56) which can be consulted in the library.

December 3rd.—EXHIBITS.—Mr. Riches: a bred series of *Plusia moneta* from Hornsey Rise, 1918. Mr. Bowman: pale forms of *Rumicia phlaeas* (one approaching ab. *schmidtii*, Epping Forest, August 3rd, 1913); suffused forms, including one almost wholly black (Horsley, August 20th, 1910), only a small amount of the coppery colouring being present on the forewings.

COMMUNICATIONS.—Mr. Newman remarked on the late emergence of a brood of *Polygonia c-album* in his breeding cages. The larvæ had fed up slowly and the imagines appeared November 25th to 27th and were to-day flying actively about his hot-house.

ARCHAEOLOGICAL SECTION. REPORT FOR 1918.

1. Owing to war conditions the Section has not found it possible to make any inspections or excursions during the year.

2. Three meetings of the Section were held, *viz.*, on March 19th, May 21st, and October 29th.

3. At the Meeting on May 21st, which was well attended, Mr. W. J. Maxton, of the Battersea Field Club, lectured on the Daily Life of a Mediæval Monastery.

4. On October 29th Mr. E. Chapman read a paper on "Some Churches of South Sussex" (New and Old Shoreham, South Lancing, Sompoting, Steyning, and Bramber).

5. The MS. of Mr. Chapman's paper as above, and the Record of the visit on July 14th, 1917, to the Earthworks of Epping Forest, have been placed in the Society's Library.

E. B. BISHOP, *Chairman*.

E. CHAPMAN, *Secretary*.

November 20th, 1918.

REPORT OF THE COMMITTEE OF THE ORNITHOLOGICAL SECTION.

1. As stated in the Report for 1917, the Ornithological Members of the Society decided to adopt the suggestion of the Council and to form themselves into an Ornithological Section. Thirty-three Members of the Society intimated their willingness to join, and were duly registered. At the first Meeting of the Section, on November 20th, 1917, a Committee was elected, consisting of the following Members:—Mr. S. Austin, as Chairman; Mr. A. Brown, as Secretary and Recorder; together with Messrs. C. S. Bayne and P. J. Hanson. Owing to the demands on the Secretary's time, Mr. L. J. Tremayne agreed to undertake the recording work as Acting Recorder. Mr. Bayne had to withdraw from active work on the Committee on account of taking up military duties. (These officials have been re-elected for 1919.)

2. Eight Members of the Section are still absent on active military service. It is hoped that on their return to civil life, at no distant date, they will be in a position to resume Ornithological work for the Society.

3. Four evenings were allotted by the Council for Sectional Meetings, and one Field Excursion was held during the year. Four Committee Meetings were also held. A Paper on "Bird Migration," by Mr. F. J. Stubbs (Curator of the Stepney Borough Museums), postponed from last year, was arranged by the Committee for an Ordinary Meeting of the Society, on May 7th. With reference to this lecture, the Committee would like to place on record that, in their opinion, Mr. Stubbs's theory respecting the law of migration is of the

utmost importance, and may well prove to be of an epoch-marking nature. The Committee also provided Papers for the Chingford Branch—on March 11th, "Some Rarer British Breeding Birds," by Mr. P. J. Hanson—and on December 2nd, "Some Ornithological Notes by an Amateur," by Mr. S. Austin.

4. Two valuable reports on the Avifauna of Salonica and Macedonia have been received during the year from our member Mr. W. E. Glegg, R.A.M.C., on service in these districts. Both reports have been read at meetings of the section, and it is hoped that practical use may be made of them at a later date. A communication from Mr. C. S. Bayne (while on service), on the change of plumage in the Black-headed Gull, was also read.

5. The 1918 Report on the Birds of Epping Forest is printed elsewhere in the Transactions. Records from members, and others, will be welcomed.

6. The Committee have long felt the need of a suitable map showing the Society's local district and its sub-divisions. Such a map should be in the hands of all those assisting in the work of recording, and it is the Committee's intention to press upon the Council the absolute necessity of issuing in a suitable form such a map for distribution.

7. No instances of ringing, under the "British Birds" Marking Scheme, have been recorded by members of the section, and no recoveries of past markings have been reported.

8. No additions to the collection of photographs of birds and nests have been received during the year.

9. The Acting Recorder has drawn up a Report on the present state of the Records of the Section, which discloses the fact that great disparity exists between the numbers and interest of records received from the various divisions of the Society's district. The Report also includes some valuable suggestions as to improved methods of working, which suggestions the Committee have adopted. Annual statistics of the records received will be published, by which means the poorly recorded sub-districts will be disclosed, and it is hoped that additional help in recording will be forthcoming. The statistics of the ornithological records up to the end of 1918 are as follow:—

(a) The total number of notes recorded for the 24 sub-districts during the year 1918 were 1296, divided as under:—

NORTHERN DISTRICT.

Sub-district.

No.		...	...	1
1.	Colnbrook	...	...	—
2.	Rickmansworth	...	...	—
3.	Hounslow	...	...	32
4.	Harrow	...	...	18
5.	Mimms	...	...	44
6.	Hampstead	...	...	113
7.	Enfield Chase	...	...	88
8.	Lea Valley	44
9.	Epping	535

Sub-district.

10.	Hainault	23
11.	Brentwood	75
12.	Rainham	84

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SOUTHERN DISTRICT.

Sub-district.

No.	1.	Weybridge	1
	2.	Wimbledon	140
	3.	Chessington	4
	4.	Norwood	...	...	16
	5.	Banstead	...	...	21
	6.	Caterham	...	...	23
	7.	Holmesdale	...	...	2
	8.	Blackheath	66
	9.	Kent Marshes	1
	10.	Darenth	6
	11.	North Downs	3
	12.	Westerham	6

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(b) The total numbers of different species of birds and nests recorded in the various subdivisions, since the scheme was started, up to the end of 1918, are as follow :—

NORTHERN DISTRICT.

<i>Sub-division.</i>			Birds.	Nests.
No.	1.	Colnbrook	...	44 ... 5
	2.	Rickmansworth	...	64 ... 29
	3.	Hounslow	...	71 ... 11
	4.	Harrow	...	78 ... 32
	5.	Mimms	...	33 ... 9
	6.	Hampstead	...	108 ... 45
	7.	Enfield Chase	...	94 ... 35
	8.	Lea Valley	...	116 ... 42
	9.	Epping	...	124 ... 77
	10.	Hainault	...	68 ... 52
	11.	Brentwood	...	75 ... 46
	12.	Rainham	...	47 ... 46

SOUTHERN DISTRICT.

<i>Sub-division.</i>			Birds.	Nests.
No.	1.	Weybridge	...	1 ... 2
	2.	Wimbledon	...	60 ... 5
	3.	Chessington	...	6 ... 1
	4.	Norwood	...	13 ... —
	5.	Banstead	...	21 ... —
	6.	Caterham	...	17 ... 6

Sub-district.

7.	Holmesdale	...	2	...	1
8.	Blackheath	...	33	...	4
9.	Kent Marshes	...	1	...	—
10.	Darenth	...	5	...	2
11.	North Downs	...	3	...	—
12.	Westerham	...	6	...	1

N.B.—The year 1918 represents the first year's work for the Southern District.

10. The collection of records for the southern part of the Society's district has now been undertaken by the Section. Owing to so many of the members being away on active service, or otherwise engaged on war work, the recording done, both North and South, has been but small. Help in this work is badly needed.

Our thanks are due to all those members of the Society who have assisted us in our work, and also to the following friends, to whom we are indebted for so many of our most interesting records and notes, viz.:—The Misses A. Hibbert-Ware and G. M. Towsey, and Messrs. J. E. S. Dallas, R. Hay Fenton, G. R. Humphreys, H. C. Playne, C. N. Roper, R. P. Sewell, E. R. Spragg, and F. J. Stubbs.

11. Three species new to the Northern area have been recorded during the past year, making the total number 153. These new occurrences are, *Merlin* (*Falco aesalon*), seen flying over the golf course at Theydon Bois, on January 20th, 1918; a skein of about 15 *Grey-lag Geese* (*Anser anser*), from the same district, on March 22nd, 1918; and the *White-fronted Goose* (*Anser albifrons*), also from the same district, in the winter of 1917-18; reported by Mr. F. J. Stubbs, per S.A. and A.B.

12. Other interesting records are as follow:—Northern district.—*Curlew* (*Scolopax arquata*), Theydon Bois, on January 6th, 1918; *Herring Gull* (*Larus argentatus*), Theydon Bois, on March 3rd, 1918; and *Maggie* (*Pica pica*), Navestock, on December 7th, 1918. Reported by Mr. F. J. Stubbs per S.A. and A.B., *Kingfisher* (*Alcedo ispida*), nesting, at Woodford, April 23rd, 1918; *Lesser Redpoll* (*Acanthis linaria cabaret*), nesting, at Woodford, May, 1918; *Wryneck* (*Jynx torquilla*), observed near Theydon, on April 25th, 1918, and near Chingford Hatch, on April 30th, 1918. Reported by Mr. H. C. Playne, per S.A., *Lesser Redpoll* (*Acanthis linaria cabaret*), heard in Great Monk Wood, on June 1st, 1918, and June 8th, 1918. Reported by Mr. R. Hay Fenton, per S.A., *Whinchat* (*Saxicola rubetra*), Warren Plain, Loughton, May 12th, 1918. Reported by Messrs. S. Austin and A. Brown, *Buzzard* (*Buteo buteo*), Ilford, on May 9th, 1918. Reported by Mr. Colin Murray; *Wheatear* (*Eenanthe cœnanthe*), Bush Hill Park, on September 6th, 1918; and *Red-backed Shrike* (*Lanius collurio*), nested at Bush Hill Park, on May 23rd, 1918. Reported by Mr. P. J. Hanson, *Spotted Flycatcher* (*Muscicapa grisola*), pair and three young in Springfield Park, Clapton, on July 21st, 1918; and *Tufted Duck* (*Nyroca fuligula*), female and three young on Racecourse Reservoir, Walthamstow, on July 21st, 1918, reported by Mr. A.

Brown. *Great Spotted Woodpecker* (*Dryobates major anglicus*), pair and young bird, nested near Ludgate Plain, June 15th, 1918; *Wheatear* (*Enanthe enanthe*), male bird, near Fairmead, October 6th, 1918, reported by Mr. J. Ross.

Southern District.—*Sparrow Hawk* (*Accipiter nisus*), nest, eggs and young birds, Warlingham, June 6th to July 20th, 1918, reported by Mr. J. E. S. Dallas, per S.A. *Wheatear* (*Enanthe enanthe*), seen on Ham Common, on May 11th, 1918, reported by Miss G. M. Towsey per S.A.

For the Committee of the Ornithological Section of the L.N.H.S.

A. BROWN, *Secretary*.

January 31st, 1919.

REPORT OF BOTANICAL SECTION.

During the year three sectional meetings have been held on the undermentioned dates:—

March 19th.—Discussion, "Critical Grasses of the London District," introduced by L. B. Hall, F.L.S.

September 24th.—Exhibits, Records, and Communications.

November 26th.—Exhibition and discussion, "The Genus *Polygala*," introduced by R. W. Robbins.

The two meetings fixed for February 19th and July 18th, respectively, fell through.

The Section was also responsible for an excellent lecture on October 1st, before the Society, on "Lichens," by Mr. R. Paulson, F.L.S.

No excursion took place during the year.

The Section and the Society generally have suffered a grievous and irreparable loss through the death of Mr. C. S. Nicholson. For the last few years his health has been such as to preclude any sustained botanical work, but we had all hoped until the last that he would be spared to us for some time to come. Only those who came into intimate association with him know the immense amount of quiet painstaking work performed by him on behalf of the Society in recording, in perfecting the Herbarium, and in numberless other ways. His kindly personality will be keenly missed by all of us, and his many friends will always hold him in affectionate remembrance.

As regards the northern portion of our area the sad news above mentioned makes it obvious that very little additional recording has been accomplished during the year.

The new records for the southern portion, that have come to hand and been dealt with, include no rare species. Mr. L. J. Tremayne has rendered useful service in filling up gaps with lists of more or less common species, observed by him in his tramps in the outer suburbs, etc.; and Mr. R. W. Robbins has compiled records of plants observed round about Limpsfield. Our records would rapidly become more complete if other members would follow these excellent examples, sending specimens to our recorders whenever possible, especially of the rarer and more critical species.

During 1918 26 new species were added to the Southern District List, the most noteworthy being the following:—

Alchemilla vulgaris, Linn.

Galinsoga parviflora, Cav.

Silene flarescens, Bernh.

Marrubium vulgare, Linn.

Gnaphalium sylvaticum, Linn.

Orchis pyramidalis, Linn.

Outside the Society's area the most interesting records by our members have been *Salix pentandra*, Linn., discovered by Mrs. C. L. Wilde, near Tewkesbury, in September, 1918, which, on the authority of Mr. G. Claridge Druce, F.L.S., is the first record for this species in Gloucestershire. Mr. L. J. Tremayne records *Cladium mariscus*, Br., from Swanborough Lake, Arundel Park, Sussex. It appears, however, that this species was recorded from the before-mentioned station in 1875, by Rev. J. Fraser, and is known to have been introduced. (See "Journal of Botany," 1901, p. 419.) It is of some interest to find that the species has persisted there for at least 43 years, but there is no record of *C. mariscus* as a native of Sussex. Mr. R. W. Robbins has found *Osmunda regalis*, Linn., in an undoubtedly wild situation in Surrey, but it is not deemed advisable to mention the exact locality.

R. W. ROBBINS, *Chairman*.

C. L. WILDE, *Secretary*.

November 18th, 1918.

LEPIDOPTERA SECTION—REPORT FOR 1918.

Owing to the falling off in the number of members at the meetings, the work of this section has been greatly hampered during the year under review, and it is to be hoped that a special effort will be made by members, especially those resident in or near London, to attend the meetings more regularly in the ensuing year. The war has been mainly responsible, both directly and indirectly, for the small attendance at our meetings, but with the restoration of peace we are looking forward to fuller support in order to ensure the successful working of this Section.

EXHIBITS.—Of the exhibits the following are noteworthy:—

Dr. Cockayne exhibited butterflies from the north-east corner of Russian Lapland, comprising *Aporia crataegi*, *Pieris brassicae*, *Pieris napi* var. *bryoniae*, *Colias palaeno* var. *lapponica*, *Erebia lappona*, *Erebia disa*, *Brenthis freija*, *Aphirape*, and *Pales* var. *optilete*, *Thecla rubi*, and a bred series of *Vanessa urticae*.

Mr. A. W. Mera showed preserved larvæ of *Amphidasys betularia*, the colour of which had been influenced by the food-plant, those that had fed on blackthorn and beech being dark brown, whereas those that had fed on willow were green; also a series of *Demas coryli* bred from Epping Forest larvæ, in several examples of which the chocolate bar on the upper wings was so pale as to be hardly discernible.

Mr. V. E. Shaw showed an example of *Limenitis sibylla* from the New Forest, including an example of var. *nigra*.

Mr. R. T. Bowman exhibited a long series of *Cidaria truncata* bred from a ♀ captured in June of last year, at Horsley, the series includ-

ing third and fourth broods, which emerged in October and December respectively. In these two broods, the yellow forms, which the second brood produces, were entirely absent, and the examples were remarkable for their size, being mostly as large as the original wild captured ♀; also an almost black example of *Cymatophora octogesima*, captured at Chingford.

Mr. C. H. Williams showed aberrant examples of *Lycaena coridon*, including vars. *syngrapha*, *fowleri*, and *obsoleta*, also a nicely striated ♀ underside and a slate coloured ♂ from Royston, the latter being a very rare form.

COMMUNICATIONS.—Some interesting notes were received from Mr. L. B. Prout regarding the lepidoptera he had met with this season in the Godalming district, and called forth an expression of appreciation from the members of the Section who had the privilege of hearing them.

The following is an extract from Mr. Prout's notes :—

Xylina socia.—Two hibernated examples taken on palings, January 15th.

Hibernia leucophaearia.—Two examples taken on January 15th. Abundant throughout February in interesting variety.

Hibernia marginaria.—First noticed on January 21st, lasting until the end of March. Some male examples were dark, but not of the extreme infuscated form.

Nyssia hispidaria.—Only one example seen on February 27th.

Phigalia pedaria.—Occurred freely, commencing on January 22nd.

Anisopteryx aescularia.—Appeared on March 1st, but scarce.

Hibernia rypicapraria.—One seen on February 15th.

Tephrosia bistortata.—In fine form from February 11th until well into May, though scarce and mostly worn after the middle of April.

Anticlea badiata.—First appearance on March 15th.

Xylocampa areola.—First appearance on March 16th.

Brepkos parthenias.—First appearance on March 21st, and afterwards abundant.

Euchloë cardamines.—First appearance on March 24th, an extremely early date.

Pachycnemis hippocastanaria.—Abundant on March 22nd.

Amphidasys strataria.—An example taken on March 23rd.

Vanessa polychloros.—Common the previous year.

The sallows produced *Taeniocampa stabilis*, *incerta*, *munda*, *gothica*, *pulverulenta*, and one example of *miniosa* on March 20th; also hibernated examples of *Scopelosoma satellitia*, *Cerastis vaccinii*, and *Gonoptera libatrix*.

Geometra papilionaria.—Rather scarce.

Macroglossa bombylifformis.—Very plentiful, a catch of 29 having been made by two collectors in one afternoon.

Sesia sphegiformis.—An example taken at buckthorn bloom (*Rhamnus frangula*), on June 12th, together with *Melanippe hastata* and the "Pyrale" *Ennychia octomaculata*.

Nemeobius lucina.—A few examples seen.

- Zygaena trifolii*.—First seen on May 26th, and soon became very common. One or two fine confluent forms taken.
- Palings produced *Hadena dentina*, *thalassina*, *genistae*, *Xylophæsia rurea*, *Aplecta nebulosa*, *Xylina socia*.
- Thera variata*.—Fairly common among spruce.
- T. obeliscata*.—Common among Scots pine.
- Zonosoma pendularia*, *porata*, and *punctaria*.—Occur freely.
- Z. omicronaria*.—Very scarce; maple not much in evidence.
- Asthena luteata*.—Rather uncommon.
- Eupisteria oblitterata*.—Common wherever alder occurs.
- Tephrosia crepuscularia*.—Appeared on May 18th, but rather scarce.
- T. consonaria*.—First appeared on May 3rd, but scarce.
- T. luridata*.—Fairly abundant.
- Boarmia consortaria*.—Appeared on May 17th and was still to be found in the middle of June—abundant.
- Epione adnenaria*.—Common among bilberry and also in some woods, where it affects one of the alternative food-plants.
- Melanippe hastata*.—Not uncommon.

REPORTS.—Mr. Newman reported that in certain lanes in North Kent, where in previous years he had taken numbers of larvæ of *Lasiocampa quercifolia*, they were scarce this year. In one lane, however, in contrast, he had to record the taking of no fewer than 84 larvæ in a short space of time.

R. T. BOWMAN, *Secretary*.

February 4th, 1919.

REPORT OF PLANT GALL SECTION, 1918.

During the year 1918 a considerable number of records have been made in reference to the distribution of Plant Galls in the Society's district. Mr. L. J. Tremayne has given special attention to the occurrence of the commoner species, and has sent in a large number of notes with localities of species observed.

The following species, which are not mentioned in Swanton's "British Plant Galls," are worth special note:—

On *Radicula amphibibia*, Druce.

Contarinia nasturtii, Kieff.

Flower swollen, ovid. Near Richmond, Surrey, June 24th, 1918, L.B.H. Given by Houard as occurring on the continent on *R. palustris* and *R. sylvestris*, but not mentioned on *R. amphibibia*. Given by Carpenter as occurring in Britain on *Brassica rapa*.

On *Stellaria holostea*, L.

Perrisia silvicola, Kieff. (Houard 2811.)

Larvæ in pouch formed by two terminal leaves of shoot. Whitechurch, Middlesex, September 22nd, 1917, L.B.H. Record for the North of England by Bagnall and Harrison, published May, 1918, as new to Britain on this host plant.

On *Medicago lupulina*, L.

Perrisia lupulinae, Kieff. (Houard 3507.)

Globular axillary gall. Amberley, etc., West Sussex, June 27th, 1917, L.B.H. Record for Durham published by Bagnall and Harrison, in May, 1918. Mr. Burkill has found the same species forming a pouch of the folded leaflet.

On *Trifolium repens*, L.

Briophyes plicator, Nal., var. *trifolii*, Nal. (Houard 3560.)

Flower head converted into a bunch of diminutive stalked leaves. Broxbourne, Herts, July, 1909, L.H.B.; Bosham, W. Sussex, August, 1917. Recorded on "Clovers" in the North of England, by Bagnall and Harrison. Record published May, 1917.

On *Pimpinella saxifraga*, L.

Lasioptera carophila, F. Loew. (Houard 4448.)

Larvæ in swellings at base of umbel. Biggin Hill, Kent, September 30th, 1917, L.B.H. Recorded for Durham by Bagnall and Harrison, in May, 1918.

On *Populus tremula*, L.

Eriophyd. (Houard 500.)

Margin of leaf inrolled, wrinkled, not pilose. Epping Forest, Essex, June, 1916, J. Ross and L.B.H.

On *Populus tremula*, L.

Harmandia globuli, Rubs. Larvæ in rounded swellings, usually bright red, on upper surface of leaves. This gall resembles small examples of the common *H. tremulae*, but differs in having much thinner walls, is less rounded in section, and forms a much blunter angle where it joins the leaf blade. Winchmore Hill, Middlesex, July, 1917, also in Surrey, Herts, and Sussex, L.B.H. Recorded by Houard for "Europe totale," but I cannot trace any previous record for Britain. It is frequent in the London district, but has probably been overlooked owing to its resemblance to *H. tremulae*.

L. B. HALL.

November, 1918.

CHINGFORD BRANCH—REPORT FOR 1918.

There has again been a small increase in the local membership and, notwithstanding the unfavourable war conditions, the general interest in the branch has been more than kept up, as instanced by the increased average attendances. These were 28.2 as against 18.4 in 1917, or more than 50 per cent. better. The lowest was 15 (on a very stormy evening) and the highest 60.

There were nine indoor meetings, at which the following lectures or papers were given:—"Notes on some Notable Naturalists," by Canon Russell; "Moths and Butterflies, Pupæ and Imagines," by R. T. Bowman; "Some rarer breeding birds," by Mr. P. J. Hanson; "Our Chingford Forest," by Mr. J. Ross; "Nature Notes in Epping

Forest," by Mr. Hugh Main ; " Rambles in the Alps and Jura," by Mr. E. Samuelson ; " The larger Fungi of Epping Forest," by Mr. F. G. Gould : " Insect transmitters of disease," by Mr. A. W. Bacot ; " Some Ornithological Notes by an amateur," by Mr. S. Austin.

The Chairman of the branch is the Rev. Canon Russell, M.A., and the Secretary, E. Samuelson, 39, The Ridgeway, Chingford, E. 4.



MIGRATION AS A BIOLOGICAL FUNCTION.

By FREDK. J. STUBBS.

(Delivered in substance before the Society, May 7th, 1918.)

When approaching the subject of migration two things should be borne in mind, or, rather, accepted as necessary axioms, not to be ignored if we would understand this great function of life. For I call migration a function. It is more than a mere instinct or a habit; it by no means confined to birds; and its influences reach the life of all organisms, animal or vegetable, which inhabit the earth. The first point to be remembered is that migration as a study should not be the monopoly of the ornithologist, and that the phenomenon is more intimately bound up with the science of botany. The second point is the magnitude of the process of migration, so far-reaching that it exceeds in importance every terrestrial manifestation with the exception of life itself.

As migration is based on plant life it may be necessary to present a short sketch of one or two facts in elementary vegetable physiology. If one asks a man for his opinion on the source of plant food he is almost certain to mention the soil, and to omit the other factors. Really, of the four prime plant needs, soil is the least important, and is dispensed with by the many rootless aquatic plants which exist in the sea or in fresh waters. A better answer would substitute for the term "soil" the various *inorganic* substances which are needed by the plant, and which can be derived only from the earth, and then only in the form of watery solutions. Water is thus another of the four essentials. No plant can develop without it, and in a frozen land, or in a perfectly dry desert, either sandy or rocky, no vegetable can live.

But the most important of plant foods is derived from the air. This is the element carbon, the basis of all living substances, either animal or vegetable. The biologist, according to the bias given by his special studies, may claim the prior importance of oxygen, or of hydrogen, or of nitrogen, all of which are vital; yet the following remarks will show why I believe that carbon (and, moreover, the carbon of the atmosphere alone) is the real basis of life. Carbon is present in the air in the proportion of about .04 per cent., and is taken up by plants through the stomata of the leaves. Submerged aquatic plants have no stomata, but for the sake of simplicity, without violating any law, I can treat all plants now as though they were terrestrial. Water consists of hydrogen and oxygen (H and O are well-known symbols for these elements), while atmospheric carbon is in the form of carbon dioxide (CO₂).

From these three elements are built up the carbohydrates—C, H, and O, in various proportions—on which are based all plant tissues, and, it is equally important to remember, all animal tissues also. The

animal cannot eat, or at least cannot derive nourishment from, any combination of lifeless air, water, and earth. It depends entirely for food on the tissues of plants, so that the animal, from the amoeba to man, is a sort of parasite on the vegetable world; and the basis of all this life consists of the carbon making its way through the microscopical stomata of the growing plant. The green leaf is thus the veritable cradle of life.

The fourth requisite of the growing plant is a force so great and so universal that it may be mentioned last for no other reason than the fact that it is not confined to our earth alone. I refer to sunlight, without which no plant can gather carbon. The assimilation of this element takes place only in the actual presence of sunlight. Water, soil, and carbon are (we can say) present everywhere. The abundance or poverty of vegetation is governed only by the amount of sunlight falling on that particular part of the world.

Solar energy, therefore, can now be mentioned as the source of all life. This fact, the bare statement of which by itself may seem like a fragment of unscientific mysticism, is unquestionable, and it ought really to be the foundation stone of all biological science. Too often the student is left to discover it for himself, and may perhaps advance far in his particular field without divining the dependence of life on the sun. Plants store solar energy, turning it into potential energy, while animals in digesting the vegetable tissues change it into the kinetic energy which we see as the manifestation of animal life. Plants hoard life, animals spend it. Are we to be credited with anything in return? Certainly; for, by our activities, we release the carbon, returning it to the atmosphere to be again used by the plant. Were plants ceaselessly growing, and were no carbon being returned to the air by animals, life must come to an end. Remember also that oxygen, essential to animals, is a waste product of plants, and is evolved copiously in sunlight. Each of us, plant and animal, thus lives on the waste products of the other, a "balance of life" beautifully illustrated in a good aquarium, which may be sealed from the air and yet remain full of vigorous life for year after year if allowed to gather the energy poured out by the sun.

A little thought will show that the amount of sunlight reaching all parts of the earth outside the tropics varies according to the season. At the North Pole there is sunlight for half the year, and darkness during the remaining six months. In England the conditions are not changed to this extreme, but we get (say) eight hours sunlight each day in winter, and sixteen in summer. Experience of aquaria teaches us that a certain amount of plant life is necessary to support a certain fixed amount of animal life. This is equally true for a country or a hemisphere. Those parts within the Arctic Circle where the temperature rises above freezing point (thus releasing the water) are covered in summer with luxuriant vegetation, tirelessly gathering the carbon from the air, ceaselessly evolving the oxygen so necessary to ourselves. In order that the greatest possible amount of life may be crowded into the earth, in order that the last fraction of solar energy may be captured, it is essential that the carbon stored by these Arctic plants be returned to the air.

To a large extent this work is accomplished by insects and other lowly organisms which die down like the plants at the approach of the dark winter. In the same way, but not in so marked a form, this process of summer life and winter sleep obtains in temperate lands also, the contrast varying according to latitude. Clearly a summer woodland or meadow can support more life than the same area in winter. Co-ordinated hibernation by plant and animal might be deemed sufficient to maintain the balance of life until we study the danger of plants allowing their stored carbon to become locked up in the soil as peat or as coal. It is probable that these deposits of carbon, the proper place for which is in the atmosphere, indicate great catastrophes to animal life in distant epochs.

For the balance of life on the earth to be maintained, and for the support of the greatest quantity of organic life, it is necessary to have a highly locomotive form of animal life flowing twice yearly from hemisphere to hemisphere. The whole of the animal population need not move. A part may hibernate; another part, in the Tropics, may be able to exist without change throughout the year; even such animals as the fox or the pike are compelled in temperate lands to confine their periods of energy in relation to seasonal sunlight. But a certain proportion of carbon-releasing life does actually pass like a great tide from Pole to Pole, in pursuit of the sun. Ornithologists need not be reminded of such birds as the knot or curlew sandpiper, breeding within the Arctic Circle, migrating to the Antarctic circle in autumn. There are the real migrants—the EU-MIGRANTS, to adopt a term already used in a somewhat different sense.

Yet these are not the only animals that move according to season, and a vast host of birds, mammals, fishes, and even insects ebb and flow each spring and autumn for distances that are to be measured in scores or in thousands of miles. We are apt to view the swallow or the cuckoo as the chief migrants. Really every bird in England (pheasant, grouse, rock-dove, sparrow, and one or two other exceptions are hardly worth mentioning) travels towards the north in spring and towards the south in autumn. Try to estimate the actual weight in tons of this equinoctial flood of highly organised flesh and blood. It must be reckoned, for our islands alone, in millions of tons. For example, in 1893 Professor A. Newton made an estimate of the number of puffins present at a single breeding station in the Hebrides. The result was 3,000,000 birds, a total of almost exactly one thousand tons. Add to this the many other puffin colonies, the great congregations of such breeding migrants as gulls, auks, plovers, or ducks; the total number of swallows, cuckoos, and other summer migrants, together with the millions of so-called "native" robins or thrushes. Should not the estimate in tons reach seven figures? Year by year, we note with sorrow, many of these migrants decrease in numbers. The old accounts of the hordes of wild fowl coming each spring to the marshlands of the Middle Ages are beyond belief to one who has not studied the changes in the face of England during the past few centuries. Man has all but exterminated the migrant whales and seals of our own seas; the bison as migrant has ceased to exist in

America. The mammoth, migrant of earlier days, died out for some reason unknown, although the event was doubtless connected with an alteration in the course or duration of the seasons in Europe.

The migrant is a specialised animal, and therefore in danger of extermination. Take, for example, the swallow, which lives only by wintering in Africa, yet owes its structure to the insects swarming in an English summer. If mankind progresses, all our country will be cultivated to the last possible inch. We shall by then, no doubt, have solved the problem of insect pests, and no plants will be allowed to become metamorphosed into the flies or beetles which form the support of insectivorous birds. What then will happen to the swallow? What will be the fate of a hundred species almost similarly placed? I find it difficult, under such circumstances, to foresee anything except sudden extermination.

In the fateful year of 1914 one date stands out as a warning to those who believe so fondly in the permanence of the human race, and I would like to discuss it in connection with migration and the fate of empires. The date was the first of September, for then, in the Cincinnati Zoo, died a female passenger pigeon (*Ectopistes migratorius*) which had passed the previous fourteen years in captivity. It was the last survivor of its race, and the species is now to be classed with the great auk, the dodo, and the pterodactyl. Within the memory of men still alive the passenger pigeon swarmed by the million in American woodlands. Alexander Wilson estimated a single flock to consist of 2,300,000,000 birds. In 1879 Brewster described a breeding colony in Michigan. It covered a stretch of forest thirty miles long by four broad, every tree holding some nests, many being filled with them. The birds arrived one spring day in a compact flock, five miles by one in extent; and from this colony, in that year, a single hunter managed to kill or capture some millions of pigeons. There were other great breeding grounds also, but to-day all are empty.

The passenger pigeon was alert, strong, swift of wing, fecund to a high degree. In a way it might have been viewed as the apotheosis of avian structure, safe, if any bird is safe, from the attacks of enemies. Many years ago, when the species was noticed to be diminishing in numbers, strict laws were passed both in the States and in Canada for its protection; and during the last twenty years government efforts were directed to the active preservation of the remnant of the flocks of past years. All was in vain. The passenger pigeon, in spite of its power, has slipped out of the life of the world—a sorry reward for its long and arduous duties as migrant.

For the migrant is essential to us, as necessary to our life as is solar energy or the green plant. Nature demands always a creature or a set of creatures which must undertake the work of swinging annually around the globe in the path of the sun. No reward; except, perhaps, the power of flight, or other means of locomotion. The rocks are full of the remains of flying pterodactyls, swift fishes, mammals endowed with endurance in travel, all beyond doubt the ordained migrants of past ages. And all are gone.

The bird, too, is going. We have already noted the disappearance

of the wildfowl of English marshes now turned into cornfields, and speculated on the fate of the swallow and its kind. What animal is ready to take the place of the bird? Without question this animal is man, already holding the second rank as migrant, and in the near future to exceed the labours of the bird. But, for the first time in the history of the world, migration is by proxy. We stay at home, leaving the transport of "bottled sunlight" to the ships which carry bread or beef from sunnier lands to be reduced to their elements in the crowded cities of Europe or America. The same laws which govern the balance of an aquarium, or the life of an Arctic marsh, apply to modern traffic in foodstuffs. Carbon is fixed in Australia or Canada, to be released in Europe, again carried by the tides of the atmosphere to be shared amongst the vegetation of the world.

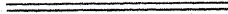
It will be noticed that Canada is mentioned, and this suggests that migration need not, therefore, be north and south. In a simpler world, with one hemisphere dark while the other was light, the migratory current would be always northward in spring and southward in autumn. Differences in land area, in the annual hours of sunlight falling upon the two hemispheres, and other factors have all tended to divert the course of the migratory movement. It might be better, perhaps, to view migration as the periodic invasion of centres of biogenetic intensity; but, as I show, the plants need not be eaten on the spot, and it is sufficient for the welfare of the life of the globe if they are reduced to their elements somewhere.

To me this problem of migration is an awe-inspiring phenomenon. I feel that I have not done justice to its importance, and can only trust that my remarks may lead others to approach the subject from the same direction. In the "Zoologist" for December, 1912 (4th series; vol. xvi., pp. 441-49), I attempted to crowd my ideas into a short paper. Shortly afterwards I came into possession of a pamphlet—*Leçon sur La Statique Chimique des Êtres Organisés*—by Dumas, which deals in a most lucid manner with the relations between plants and animals as a world force; and, I find, in 1844, a larger work on the same subject was published by Dumas and Boussingault. The latter I have not yet seen, but do not expect that migration entered the minds of these writers. I do not know of any English work which deals at all fully with the cosmic importance of the green plant, and some books on physiological botany dismiss the fact in a few words.* My acquaintance with the literature of migration is more extensive—an excellent bibliography, by the way, is appended to Mr. T. A. Coward's "Migration of Birds," Cambridge Manuals series—but I have not yet found any mention of the atmospheric connection between plants and migration. Several ornithologists have offered more or less tentative solutions of the problem, the simplest and best stating that migration is merely a matter of food. This explanation, of course, omits to consider the value of migration to life generally. My opportunities for extended study have been but slight during the past

* I find a note of a paper by C. Timiriazeff, entitled: "The Cosmical Function of the Green Plant," in the *Proc. Roy. Soc.*, No. 485 (1903-4), but I have not yet seen it. The title seems very interesting.

few years, and I need not mention the various works that I have read or re-read in the light of this theory of migration. Some have been bird books; many were concerned with geology, astronomy (here to be mentioned Chap. xii. in Lubbock's "Pre-historic Times," with its discussion on the Precession of the Equinoxes), ethnology, trans-oceanic commerce, and so forth.

It is, I should think, easy to be wide of the truth in so ambitious a theory as that which I have sketched; but, since 1912, I have searched in vain for any destructive set of observations, and would be glad to think that others were eager to discover the flaws in my reasoning.



REPORT ON THE BIRDS OF EPPING FOREST FOR 1919.

The Third Annual Report of the Committee of the Ornithological Section on the Birds of Epping Forest is appended. The prevailing war conditions have continued to restrict outdoor observational work and necessitate condensation in printing this report. To these conditions must also be attributed the lamentable delay in the preparation of this report, thereby unduly postponing the issue of this Volume of Transactions, which the Ornithological Committee greatly regret. Happily those conditions may now be expected to disappear gradually, and it is hoped more support may be received in the matter of records.

It has been decided to name another portion of the Forest which hitherto has presented difficulty in identifying for recording purposes, viz.:—*Warren Plain*. The area referred to lies between Warren Hill on the south, Strawberry Hill on the north, Warren Road and Paul's Nursery on the east, and Epping New Road on the west.

Members and friends are invited to send records and communications to the Secretary of the Committee, Mr. A. Brown, of 44, Ravensdale Road, Stamford Hill, N. 16.

JANUARY 2nd.—Fieldfares, 20 to 30, at Oakhill, Hale End. 5th.—Ring Doves frequent in Chingford Wood. Redwings between the Robin Hood and Warren House—very wild. 6th.—Fieldfares still about Oak Hill. Redwings near Grimston's Oak and Epping New Road—wild and vocal. In Hill Wood, Chaffinches, Great and Marsh Tits feeding among leaves. 12th.—Flock of Ringdoves, Fairmead. Most of the field-rose berries have now been eaten. 13th.—Two Herons, Higham's Park Lake. A flock of a dozen Redwings basking in the sun on sheltered side of bushes in Fairmead (cold N.W. wind). They were feeding desultorily on the haws. Small flocks of Greenfinches, same place and at the Warren, feeding on hips. Several small flocks of Ringdoves about here and Long Hills. Greenfinches feeding on ground in Chingford Wood. Chaffinches and Tits were noticed to be in fine plumage. A dozen Jays seen during the morning. 19th.—Ringdoves cooing in Chingford Wood. Great Spotted Woodpecker—apparently a pair prospecting in a tree with nesting hole. Drumming heard—also "chut" note. Five species of Tits seen about Ludgate Plain, and Tree Creeper near Cuckoo Brook. Robins singing. 20th.—Redwings on Chingford Plain—not so wild as previously. Also a few seen in Fairmead, and 2 Meadow Pipits. Green Woodpecker "yaffling" by Warren House. Tree Creeper and Marsh Tit, Great Monk Wood, and the former again seen at Jack's Hill, Theydon. 21st.—Male and female Barn Owls very noisy in the Sale, Higham's Park. 26th.—Redwings in Chingford Wood by the Plain; Hen

Pheasant, Cuckoo Pits. A solitary Moorhen on Connaught Water—where they have been absent of late. 27th.—6 Mallards on Connaught Water, and one Moorhen. Reed Bunting seen at High Beach. Two Bullfinches by Warren House. In the Alder Clump on Fairmead, 2 Tree Creepers seen; also a number of Blue Tits feeding on the catkins; also Marsh and Cole Tits. Green Woodpecker calling; Red-breasts in good song and Great Tit's "saw-sharpening" note. Song Thrush singing well in afternoon. 10 Jays noted.

FEBRUARY 2nd.—Great Spotted Woodpecker watched at nesting site near Cuckoo Brook. It drummed 25 times, generally at regular intervals. There is a low "whinnying" noise when bird is about to alight. A party of 10 Jays in 2 elm trees in field by Ludgate Plain. Their behaviour was very curious and noisy. Finally the party scattered, leaving one behind screaming very excitedly. 3rd.—Great Spotted Woodpecker again seen at same spot, apparently. Drumming heard. The "whinnying" note heard when one bird joined the other. Flock of Ringdoves at Cuckoo Pits cooing. Another pair of Great Spotted Woodpeckers observed beyond Blackbush Plain—"chnt" note and drumming heard; also courting antics watched. Wings of hen pheasant found near Ludgate Plain. Sky Larks and Song Thrushes singing in Hawkwood. Missel Thrush singing well at 3 p.m. by Warren Pond. 9th.—Marsh Tits in very fine plumage in Chingford Wood; a Heron flying over. Two Mallards on Connaught Water. 10th.—Long Tailed and Cole Tits in round thicket. Party of 8 Goldfinches seen several times on Fairmead; one in song. Treecreeper in the alder clump. A large flock of Starlings were feeding here—also a flock of about 30 Ringdoves. A Blue Tit noted in splendid plumage. Redbreasts were either paired or mating, judging by their antics. Jackdaws with Starlings feeding on Chingford Plain. 16th.—Blue, Great and Marsh Tits in Chingford Wood and at Ludgate Plain, Long Tailed Tits and Greenfinches; also the Treecreeper seen here twice. 17th.—7 Tufted Ducks (males and females) and one Blackheaded Gull on the Lake in Wanstead Park. Lesser Redpolls on the alders by Highbam's Park Lake. 23rd.—Small flocks of Ringdoves in Chingford Wood. Song Thrush singing by Bury Wood and Hedgesparrow singing on Ludgate Plain. On Fairmead 2 Goldfinches seen, one singing. A Nuthatch was watched hammering something in an oak tree—it returned three times to the same spot. 24th.—Song Thrush, Chaffinch and Hedgesparrow singing at Yardley Hill. A pair of Mallards flushed from the alder pond on Fairmead. Male Bullfinch singing at the same spot. Blue and Great Tits appear to have paired.

MARCH 2nd.—Five species of Tits noted in Chingford Wood and a Redwing on Fairmead. 3rd.—Long Tailed Tits, Ludgate Plain, and a Treecreeper seen by the Red Path. 9th.—In Chingford Wood parties of Chaffinches and Greenfinches feeding on ground. All species of Tits (5) noted near Ludgate Plain. An airship passing over Chingford Wood rather low down caused the Ringdoves to fly up, Tawny Owl flying and perching in the same place at 12.50 p.m. 10th.—Five

Tufted Ducks—both sexes—on the lake, Wanstead Park. 3 male Bullfinches on Whitehall Plain and Yellow Bunting in song near same place. 16th.—Greenfinches in fine condition in Chingford Wood uttering “cheering” note. Great Tit watched eating hornbeam seeds near Almshouse Plain, and Pied Wagtail noted same place. Two Great Spotted Woodpeckers watched in oak by Round Thicket—the “whinnying” note again heard when birds joined each other. 17th.—Yellow Bunting still singing behind Bancroft’s School. 18th.—Song Thrush’s nest, 4 eggs, Lord’s Bushes. 19th.—Kestrel seen, Fairmead. Two Mallards and male Pheasant, Jack’s Hill. 22nd.—Blackbird’s nest, 4 eggs, Lord’s Bushes. 23rd.—Chiffchaff singing, Black Bushes. Greenfinch calling in Chingford Wood. 2 Treecreepers seen, Woodman’s Glade, Great Spotted Woodpecker “drumming” and calling in Chingford Wood. 24th.—A flock of a dozen Ringdoves in Bury Wood—Long Tailed Tit building nest, Yardley Hill. Yellow Bunting and Reed Bunting seen same place.

APRIL 4th.—Redstart singing in the Sale, Higham Park. 7th.—Showery. Chingford Plain, eleven Jackdaws, one with prominent white feathers in each wing. Hawk Wood, Chaffinches and Great Tits calling, Robin and Wren singing; also two Chiffchaffs; Long-tailed, Blue and Marsh Tits, and a Hedge Sparrow seen, two Jays flushed and a green Woodpecker was heard yaffling. A Tawny Owl was seen. Two birds of prey, probably Sparrow Hawks, were observed near Hawksmouth Farm. On Yardley Hill, a Pied Wagtail, Reed Bunting and Yellow Bunting were noted; also some Goldfinches feeding on the thistle heads. Nests of the Long-tailed Tit and Thrush were found in the hedge. In Gilwell Lane, Greenfinches were seen and Wood Pigeons heard. Returning by Yardley Hill a green Woodpecker flew off, yaffling loudly, a Kestrel was noticed hovering and the song of the Willow Warbler heard. Several Carrion Crows were noted during the walk. 11th.—Four young Thrushes in the Sale, Higham’s Park. 13th.—Very large gathering of Starlings on Chingford Plain, also flock of Ring Doves. 14th.—Tawny Owls seen by Chingford Wood and two pellets found containing bones and hair of mouse (? species) and elytra of beetles. Hawk Wood, not much song, Willow Warbler and Chiffchaff noted. Two Tawny Owls flushed and pellets found. Bury Wood, about a dozen Wood Pigeons. Yardley Hill, male and female Bullfinches; Chingford Wood, many Greenfinches, two Missel Thrushes noticed. 20th.—Chiffchaff’s nest with 8 eggs in the Sale, Higham’s Park. Cole Tit calling in Chingford Wood. 21st.—Hawfinch’s nest with 8 eggs in the Sale, Higham’s Park. 22nd.—Nightingale singing weakly in the Sale, Higham’s Park. Swan sitting on 7 eggs, Higham’s Park. 23rd.—Kingfisher resting at Woodford. 24th.—Red-backed Shrike’s larder in Big Hale End, contents:—1 field mouse and 3 great water beetles. 25th.—Wryneck by side of road between Wake Arms and Theydon Bois. (I have never seen him before in these parts though I knew him well in W. of England.—H.C.P.) 27th.—Jay seen, Great Monk Wood. Willow Warbler singing freely in Chingford Wood and much other

song heard—thrushes, blackbirds, etc. To the north of the wood by Ludgate Plain, two Great Spotted Woodpeckers seen and heard drumming repeatedly and also uttering call note. A Tree Pipit singing and performing on Ludgate Plain. Male Pheasant calling in Black Bushes, and a Great Spotted Woodpecker heard here. Feathers of this species were picked up. Two Chiffchaffs singing in Round Thicket. Cuckoo heard calling in distance. Lesser Whitethroat and Tree Pipit seen and heard on Fairmead Plain. A male Mallard was flushed from the Alder Clump Pond on the Plain, but no nest could be found. In Hill Wood a Green Woodpecker “yaffling” and 2 Nuthatches seen and heard uttering two types of note; probably both sexes calling. Marsh Tit and a Redstart also noted at High Beach. Cole Tit and Willow Warbler at Loughton Camp. Male Redstart near Broad Strood. Lesser Whitethroat on Old Church Plain. In evening Ring Doves were coming into the wood to roost by Almshouse Plain. 28th.—Swallows hawking over Yardley Hill, and Blackcaps and Lesser Whitethroat singing. Blackbirds nest with young in Gillwell Lane. Pied Wagtail at Sewardstonebury. Tawny Owl roosting in holly at the Cuckoo Pits. 30th.—Wryneck seen by the bridge over Ching brook in Whitehall Road.

MAY 4th.—Swallows and Sand Martins over Chingford Plain, Jay and Redstart Fairmead Bottom. Identified on walk from Chingford to Wake Arms by way of Magpie Hill, Strawberry Hill, Black Bushes, Little and Great Monk Woods—Cuckoo, Nightingale, Blackcap, Bullfinch, Wood Warbler, Chiffchaff, Willow Warbler, Whitethroat, Lesser Whitethroat, Tree Pipit, and Green Woodpecker. In Chingford Wood a number of Rooks in trees by edge of Plain. Male Redstart singing, Ludgate Plain. Wood Warbler singing by Cuckoo Brook, and another near Bury Road. Five Nightingales singing by Connaught Water. Green Woodpecker, “yaffled,” and Great Spotted Woodpecker seen by Grimston’s Oak. 5th.—Long-tailed Tit nesting in Hawk Wood and Blackcap singing. Two Nightingales singing, also Common Whitethroat and Yellow Bunting on Yardley Hill. Swallows and House Martins over pond on Fairmead and Connaught Water. Blackcap singing, Chingford Wood, and Nightingale, Round Thicket. 8th.—Nightingale singing near Connaught Water. 11th.—Wood Warbler singing near Bancroft’s School. Several Jays, Black Bushes. Several Jays and Redstarts, Fairmead Bottom. Swift, Chingford Plain. Male Redstart, Willow Warbler, Whitethroat, Blackcap, and Nightingale on Ludgate Plain. Great Spotted Woodpecker near Cuckoo Brook and again by Ludgate Plain. 12th.—Jackdaws feeding on Chingford Plain. Heard and saw Garden Warbler by Red Path and heard 3 Nightingales. On Warren Plain saw a male Whinchat—had good views of the bird and heard the note (S.A.). A pair of Red-backed Shrikes in the same place, to the south of Strawberry Hill. A male Redstart seen and heard in Hill Wood. Several common and lesser Whitethroats heard during the week. Nightingales singing on Fairmead and Magpie Hill, 8 Carrion crows and 6 Jays seen. Tree Creepers seen in oaks opposite Chingford

Hotel. Swan sitting on nest, Warren Pond. Bubble note of Cuckoo heard, Ludgate Plain. Garden Warbler singing in Black Bushes and again on Fairmead Plain. Pied Wagtail at High Beach. 15th.—Wood Warbler singing near Buckhurst Hill Church. 18th.—Tawny Owl seen Honey Lane Quarters. 20th.—Lapwing heard Rifle Range, Woodridden. 22nd.—Four Wood Warblers singing near Wake Arms. Jackdaws and Rooks on Chingford Plain. Great Spotted Woodpecker seen and heard by Grimston's Oak. Green Woodpecker seen in Hill Wood—its movements appear to be more leisurely than the Great Spotted. Five Swifts flying over Bury Road. 25th.—Turtle Dove and two Wood Warblers, Long Running. Moorhen and male Nightjar, Great Monk Wood. Three Wood Warblers singing near Wake Arms. Starlings and Sparrows busy feeding on the great quantity of larvæ now about the woods. 26th.—Rooks and Jackdaws on top of tree near Ludgate Plain, feeding on larvæ (?). Turtle Dove near Blackbush Plain. Wood Warbler between High Beach Church and Hill Wood. During the month a pair of Lesser Redpolls were repeatedly seen at Woodford, where they were most probably nesting, although the nest was not located.

JUNE 1st.—Long Running, two Wood Warblers, several Jays, and two Nightjars, male and female. Great Monk Wood, Lesser Redpoll heard. Broad Strood, Blackcap heard. 2nd.—Numbers of Rooks and Jackdaws in Chingford Wood. Blackcap, Garden Warbler, and Nightingale heard on Ludgate Plain. Mallard and 7 young on neighbouring pond. 7th.—Fine evening. Several Skylarks singing on Chingford Plain, 8.10 p.m. Great numbers of Starlings in Chingford Wood, apparently feeding on the quantities of larvæ—the trees being badly defoliated. They looked like birds of the year. Five Nightingales heard in the neighbourhood of the lake. Also one Lesser and several Common Whitethroat. A Garden Warbler heard. Cuckoo heard repeatedly, also Ring Dove. Larks still singing at 9.45 on the Plain. 8th.—Great Monk Wood, young Willow Warblers, White-throats, male Pheasant, Tree Pipit, Lesser Redpoll heard; Nightjar's egg found; it was gone next week. Long Running, two Green Woodpeckers. Young Great Tits being fed opposite Chingford Hotel. Swarms of young Starlings on Whitehall Plain. Bubble note of Cuckoo, Chigwell Row Recreation Ground, and Pied Wagtail same place. Tree Pipit, Common Whitethroat, Turtle Dove, and Yellow Bunting singing in Hainault Forest. 9th.—Male Redstart singing by Grimston's Oak, and swarms of Starlings. Flocks of Jackdaws and Rooks at High Beach. 15th.—Fine and sunny. Flocks of Rooks and Jackdaws feeding on Chingford Plain. Larks in song. Between Connaught Water and Warren House both Whitethroats heard, and a party of young Cole Tits with parents seen, and Nightingale in good song. Willow Warbler feeding young on Warren Hill. On Warren Plain a Yellow Bunting singing, also 2 Tree Pipts singing and performing. A male Red-backed Shrike seen chasing a Jay, and the scolding note of Nightingale heard. At Strawberry Hill heard Lesser Whitethroat and Nightingale. A family of young Blue Tits in Old

Church Plain. In Ludgate Plain, Nightingale, Garden Warbler, and Whitethroat singing. Inspected nest of Great Spotted Woodpecker near Ludgate Plain, and watched the young bird repeatedly put its head out of the hole—showing the large red patch on crown. The parent birds heard but not seen. Heard Turtle and Ring Doves. Cuckoo calling. Large numbers of Starlings feeding in the oak trees by Connaught Lake. Three Jays were seen, but all were quite silent. *16th.*—On edge of Chingford Plain Jay chased young bird, which seemed to have white feathers in wing, probably chaffinch. Young bird settled in tree, and either then or just after was captured by Jay, which settled on ground, and shook and battered it; went off with it in beak, apparently dead. Small birds much agitated; male Blackcap appeared on bush. Spent an hour at Woodpecker's nesting hole by Ludgate Plain, youngster showed himself frequently, and parent bird (or birds) thrice settled on trunk of tree, but went off without feeding him. Showers came on and Tree-creeper took refuge on sheltered side of an oak where it remained motionless (J.R.). *22nd.*—Great Monk Wood, Carrion Crow, several Redstarts, Tree Pipit. Broad Strood, Reed Bunting heard. Broomhill, Bullfinch heard. Very breezy. Few Starlings about. Wren singing. Family of Hawfinches feeding on tops of oaks, evidently getting larvæ, not far from Connaught Water. Redstarts with youngsters near Cuckoo Brook. *29th.*—Great Monk Wood, Carrion Crow, Tree Pipit, several Redstarts. Long Running, Wood Warbler heard. Broad Strood, Blackcap heard. *30th.*—Cuckoo heard and Redstart's note frequent near Cuckoo Brook.

JULY 4th.—At Warren Hill, a pair of Red-backed Shrikes seen and Yellow Bunting in song. Debden Slade male Red-backed Shrike seen. *6th.*—Great Monk Wood, saw Great Spotted Woodpecker, Nightjar, Tree Pipit, Carrion Crow, Linnet. Heard Whitethroat, Chiffchaff, Jay, Yellow Bunting. *9th.*—Tit notes and calls more plentiful than for some time in Chingford Wood, both Great and Blue searching oak trunks, had not been seen doing this since the larva plague began. Blackcap in good song. Wren song frequent. Yellowhammers singing on heath near Wake Arms. *13th.*—Low call of Chiffchaff heard at Cuckoo Pits—continued for some time. Also Garden Warbler singing at same place. *21st.*—Moorhens seen on Cuckoo Pit Ponds. *22nd.*—On Chingford Plain flocks of Rooks and Jackdaws, with heads to wind, which was very high. Swifts and Sand Martins flying over Strawberry Hill. Common Whitethroat and Tree Pipit singing. At the Cuckoo Pits a Tawny Owl seen. *28th.*—Great Spotted Woodpecker, two heard near Fairmead, one seen in flight. Heard again, Hill Wood, where Jays were numerous and more noisy than they have been for some time.

AUGUST 4th.—Fine morning. By Connaught Water two Redstarts seen, one adult female and one young bird. Between the Lake and the Warren, saw one adult and one young Nightingale. Heard Turtle Dove. Watched Marsh Tit devouring eggs (?lepidopterous) deposited on a twig. On Warren Plain a flock of Starlings feeding and a

family of Red-Backed Shrikes—two adult and three young birds. Flushed a covey of Partridges—six or seven birds. By the Red Path, saw a young Red-Backed Shrike. Several Redstarts by Buttonseed Corner and Magpie Hill—mostly young birds. Swallows and House Martins hawking over Chingford Plain. Willow Warblers still singing. 25th.—Warm and sunny. Forest very silent. Saw White-throat, Great and Blue Tits, House Martins. Heard alarm notes of Wren and Redstart. During the month a pair of Magpies were observed upon two occasions near the Owl Inn, Leppits Hill.

SEPTEMBER 8th.—Very wet and windy. Hawk Wood, large party of Great Tits, no other species with them. Chingford Plain, three Sand Martins and plenty of Swallows. Bury Wood, Wren. Gilwell Lane, nine Blackbirds flew across, flushed covey of eight partridges, and the noise they made started a Tawny Owl hooting, noon. Bury Wood, Kestrel hovering, Jay heard. 22nd.—Kestrel hovering over the Warren. 29th.—A Redbreast sat so near that the white round the eye could be seen, and also that the red of the breast extended round the beak.

OCTOBER 5th.—Treecreeper, Cuckoo Pits. Swallows and Martins, Ranger's Road and Warren Pond. 6th.—Moorhens, Connaught Water. Swallows and Martins, Fairmead. Male Wheatear, also near Fairmead. 13th.—Long-tailed Tits, Ludgate Plain and near Fairmead. 20th.—Dull and drizzling. Tawny Owl flying near Warren House and another heard calling in Debden Slade. Large flock of Ringdoves, estimated at 100, over Strawberry Hill. Flock of 20 Fieldfares flying over Warren Plain. Eight gulls flying east over Connaught Water—appeared to be Black-headed gulls. Redbreasts singing; also Chaffinches. A Cole Tit heard at Strawberry Hill. 26th.—Redbreasts in good song. Several Missel Thrushes seen and heard singing—Nursery Road, Loughton.

NOVEMBER 2nd.—Great and Blue Tits much more lively in Chingford Wood. A Marsh Tit noted. 9th.—A flock of about 30 Lesser Redpolls observed in the Birches near Wake Arms. 23rd.—Song Thrushes commencing to sing, Chingford Plain. Green Woodpecker seen and heard Yardley Hill. 24th.—Song Thrushes singing, Whitehall Plain, and Redwings numerous there. Two Swans on the Ching Brook, same place. A Tree-creeper seen. 30th.—Redwings still about Whitehall Plain. A Bullfinch identified, same place. During the month Great Spotted Woodpecker seen and heard in Wanstead Park.

DECEMBER 1st.—Mild, misty and drizzling. A male Pochard on Connaught Water, also 5 male Mallards and 5 female Duck (? species), one Moorhen. On Warren Plain 2 or 3 hundred Redwings—very wild and singing a great deal. Saw male Hawfinch, also a number of Starlings. 7th.—Party of Goldfinches Yardley Hill. Tree-creeper, Long-tailed, Coal, Blue, and Great Tits, Gilwell Lane. 21st.—Red-

wing at Whitehall Plain and round Connaught Water. Finches (? species) feeding on hornbeam seeds which they took from the trees and split in their beaks. *26th.*—Dry and fresh. Near King's Oak, High Beach, number of Rocks were assembling at 4 p.m., the birds arriving from several directions. They have been noted at the same place before. *29th.*—Dull, mild, high west wind. A Missel Thrush singing by the Warren Pond. A party of Long-tailed Tits by Connaught Water. Number of Redwing on the thorn berries, Warren Plain—very wild—also 2 Reed Buntings seen here. Male Goldfinch near Warren House.

Wanstead Park Heronry.—Mr. F. F. Mackenzie reports as follows:—I don't think there was anything special about the Heronry in Wanstead Park during the year 1918. The Herons seemed much the same as usual and the nests counted numbered 56.

OBITUARY NOTICES.

CHARLES SMITH NICHOLSON.

The Society has suffered a great loss by the death of C. S. Nicholson, who passed away on Armistice day, November, 1918. For many years he has been an enthusiastic supporter of the Society, and his wide knowledge of plants has always been placed freely at the service of any who desired help in the determination of critical species. His untiring efforts as recorder of the flowering plants of the district is a permanent asset to the work of the Society. From time to time he presented the Society with numerous specimens for the herbarium.

By his will he leaves to the Society a considerable number of valuable botanical and ornithological books, a large collection of birds' eggs contained in three cabinets, also a very fine collection of dried plants in a large cabinet. These plants are nearly all of his own collecting, and their quality shows a knowledge and care in collecting and preserving that has not often been equalled. As a keen botanist, a generous supporter of the Society, and, to many, a friend who can never be replaced, C. S. Nicholson will always be remembered.

DAVID MACINTOSH.

David MacIntosh joined the Society at the formation of the Woodford Branch, and although one of the youngest members, showed a keen interest in its different activities, especially in recording the flora of the Forest area and in the subject of rock gardening.

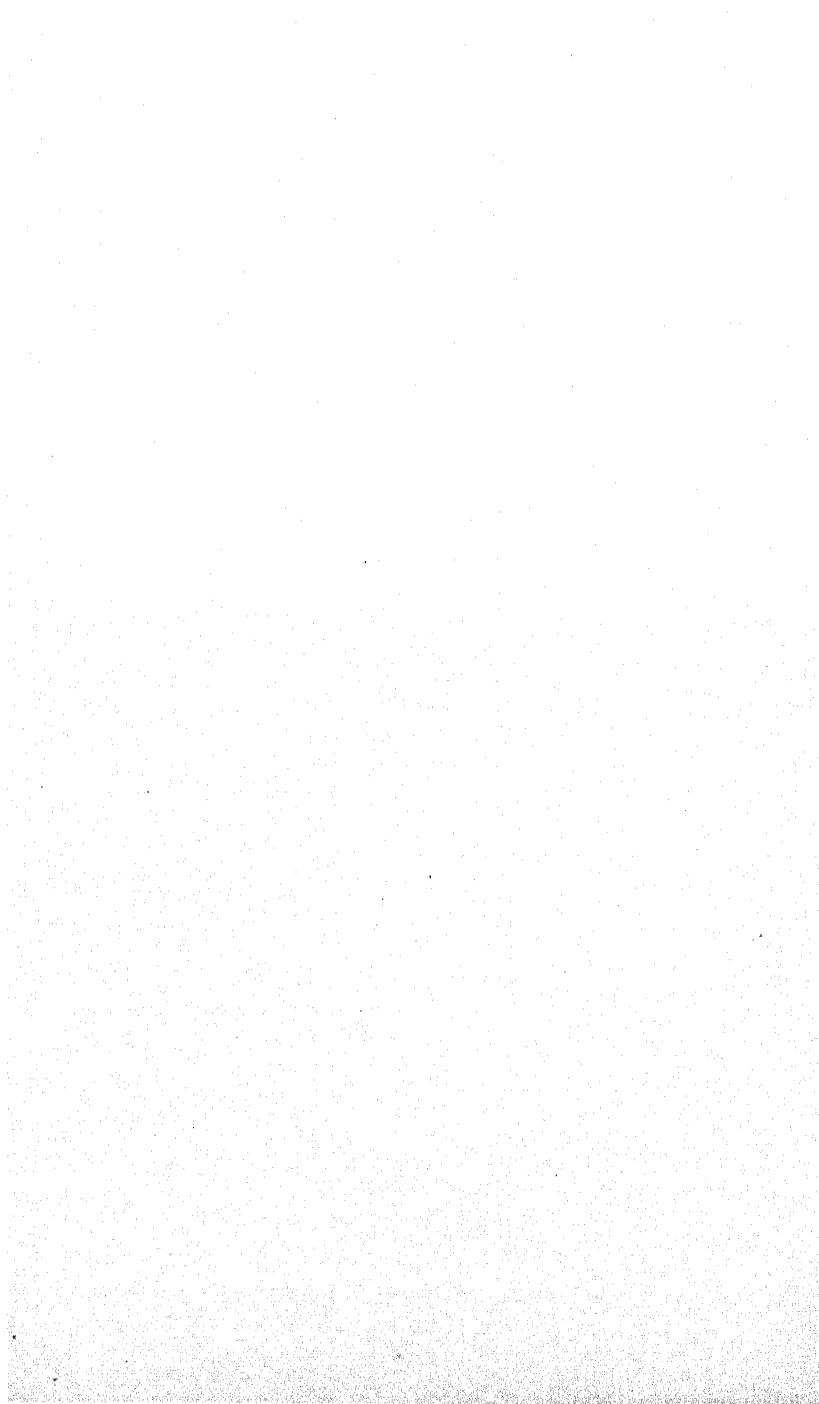
At the commencement of the war he did splendid work in the Scouts Defence Corps, gaining a special certificate of appreciation from General Baden-Powell for his work.

Later, he joined the Essex Regiment as a private, and was killed in action on August 8th, 1918, the first day of the Somme offensive, at the age of 19.

His death has been a great loss to the Society, and the deep sympathy of its members will go out to his family in its bereavement.

GEORGE BROOKS.

George Brooks died after a short illness brought on by exposure on the occasion of his final Army medical examination on February 2nd, 1918. By his death the entomological world has lost an ardent worker of the modern school of entomologists. He spent many holidays at Wicken Fen, on which he became almost an authority, and claimed to have discovered the "home" of *Tapinostola hellmanni*, of which species he made a special study in regard to its time of flight and other habits. Latterly he did good work in the Surrey districts, and at our meetings showed many specimens captured around Horsley. Those who knew him intimately can testify to his unselfish character and geniality. He was a delightful entomological companion, always ready with a witty remark, and will be greatly missed by his many friends.



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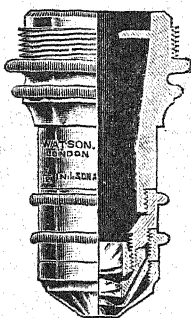
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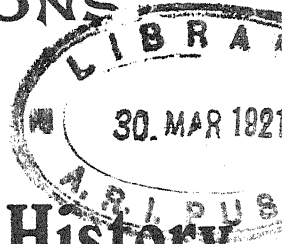
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NOTE.—The following abbreviations are used in the above lists :—Api., Apiculture; Arch., Archaeology; Ast., Astronomy; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Ethn., Ethnology; Geol., Geology; Hem., Hemiptera; Hym., Hymenoptera; Ich., Ichthyology; Lep., Lepidoptera; Mam., Mammalia; Micr., Microscopy; Neur., Neuroptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Rep., Reptilia; Zoo., Zoology. * Signifies a Life Member.

EXTRACTS FROM MINUTES

(Ornithological communications included in the Epping Forest Diary (see pp. 37 to 43 are omitted here.)

January 7th.—EXHIBITS.—Mr. Burkill showed larvæ and burrows of an unidentified sawfly in twigs of *Salix fragilis* from Weybridge and Kew, and gave a short account of the spread of *Eriophyes iriradiatus*—the mite stated to be the cause of the “witches brooms” on *Salix fragilis* and other species of willow—on the west side of London.

PAPER.—Mr. A. Capleton read a paper entitled “Antlers,” and illustrated with numerous drawings, and Messrs. Bacot, Robbins, Riches, and Ross took part in the discussion which followed.

February 4th.—EXHIBITS.—Mr. Russell James showed a series of very dark *Boarmia roboraria* from Ongar (1918), of which only a single specimen out of the large number seen was typical, and for comparison, eight typical specimens taken a few days earlier at Wyre Forest; also a box of specimens selected from a single night's captures at treacle near York, on 28th July, 1918, including long series of *Cosmia paleacea*, *Orthosia suspecta*, and *Cymatophora duplaris*, very dark *Xylophasia monoglypha*, *Aplecta occulta*, dark *Cleoceris riminalis*, *Epione parallelaria*, a small second-brood specimen of *Apamea basilinea*, and a dark-suffused reddish form of *Cosmia trapezina*. Mr. Sabine, a large number of *Noctua* collected in Co. Sligo in 1918, all in very fine condition and with many aberrations and considerable variation—*Plusia festucae*, *Aplecta herbida*, very large forms of *Acronycta euphorbiae* var. *myricae* (one being almost unicolourous blackish), fine forms of *Cirrhoedia xerampelina*, some with a unicolourous brownish ground and slightly darker central band edged with 2 conspicuous transverse yellow lines.

Mr. Shaw: a bred gynandrous *Amorpha populi* (left side ♂, right side ♀), and 2 hybrids of *Smerinthus ocellatus* ♂ and *A. populi* ♀.

COMMUNICATIONS.—Mr. Bowman said that he and others collecting at Chingford has found *Cheimatobia brumata* particularly scarce during the past season.

NEW MEMBER.—Mr. F. W. Blackburn, of Hastings, was elected.

March 4th.—EXHIBITS.—Mr. E. Aris, a series of *Bryophila perla* from Colchester, a specimen of *Arctia caia* with the left forewing almost wholly suffused with brown, a *Venilia maculata* from the New Forest, with the markings forming a band.

COMMUNICATIONS.—Mr. Robbins recorded Snipe at Itchingwood, Limpsfield, on 24rd February.

PAPER.—Mr. C. J. Burkill read a paper on "Galls caused by Sawflies," giving short descriptions of the various galls and the larvæ found in them, with the names of the different host-plants on which these galls occur in Britain and on the Continent. Messrs. Bacot, Hall, Riches, and Ross took part in the ensuing discussion.

April 1st.—EXHIBITS.—Mr. Ross showed a most interesting set of lantern slides of galls, chiefly those found on the oak.

COMMUNICATION.—Mr. Hanson recorded the Tawny Owl in Winchmore Hill Wood on the 30th March.

May 6th.—EXHIBIT.—Mr. Riches, larvæ of *Apamea ophiogramma* in the stems of Ribbon Grass from Hornsey Rise. Dr. Cockayne, the bumble bee, *Bombus lapponicus*, with its mimic *Oedinagena tarandi* (a dipterous parasite of the Reindeer) from Yukanski, on the Murman coast of Russian Lapland near the entrance to the White Sea. They were taken in July and August, 1918, and although the *Bombus* was common only 6 specimens of the dipterous were seen.

COMMUNICATION.—Mr. Burkill heard the Cuckoo on the 25th April at Roehampton.

PAPER.—Messrs. Bishop, Bowman and Hall gave accounts of the "Oak and its Insects" from the botanical, entomological, and cecidological standpoints.

Mr. Bishop opened with a brief introductory address upon the British Oaks, emphasising the specific difference between *Quercus pedunculata* and *Q. sessiliflora*, and stating that in his experience the latter species was less liable to attack by lepidopterous and saw-fly larvæ and gall-insects. Possibly the stellate hairs on the underside of leaf of *Q. sessiliflora* may be some protection. These two species, or subspecies, are the only indigenous British Oaks, but there are two others which are now well naturalised in South Britain—*Q. cerris* (Turkey Oak) and *Q. ilex* (Holm or Evergreen Crab). Both of these are practically immune from larvæ attack, and in a wood where *Q. cerris* has been introduced the most casual observer in late May or June cannot help noticing that whilst larvæ of *Tortrix viridana* have made leafless skeletons of *Q. pedunculata*, they have left untouched the glossy-leaved *Q. cerris*.

Quite contrary to popular belief on the subject, the mistletoe is a very rare parasite on oaks, there being about a dozen authentic records in Britain, seven of which are in Herefordshire. No special mention seems to have been made in most cases as to the actual species which has been the host-plant. Miss Roper has recorded this parasite upon *Q. pedunculata* and *Q. sessiliflora* in Leigh Woods, North Somerset, and the only Surrey example (at Bunningfold) is upon *Q. pedunculata*. Mr. Bishop stated that he had been informed that pigs would not eat the acorns which fell from this particular tree, but he could not vouch for the truth of this.

Mr. Bowman said: "In dealing with the insects whose larvæ feed on oak, I find that the list is so extensive that it would take up more time than can be conveniently spared this evening to deal adequately

with it. I, therefore, propose to confine myself to the insects which are to be found in one of the most important localities within the confines of the Society, namely, Epping Forest.

Of the larvæ that I shall mention, some are to be found on oak only, some are often found on oak and sometimes also on other food-plants, whereas others are only occasionally found on oak. It would, however, serve no useful purpose to attempt to subdivide them in this manner, so I shall take the opportunity of calling your attention to some cases of interest.

Many larvæ feed on the oak in the true sense of the word, eating the leaves as they move from twig to twig, but it cannot be said that they all behave in this manner. In their early stages some species are gregarious, building a large webbed enclosure which forms their habitat, until, at a certain stage, they disperse and move about singly. Whilst occupying this webbed habitation the young larvæ find their way to the leaves in the immediate vicinity, but always return to the web, which temporarily forms their "Sanctum Sanctorum."

Other larvæ, from the time that they emerge from the ova, live between leaves, which they spin together, devouring the inner surface of the leaves and, as soon as these leaves are finished with, spinning others together. There are other larvæ that do not devour the leaves at all but feed on the wood underneath the bark and in the centre of the trunk.

Larvæ may be found on the oak at all times of the year; for even during the winter months, when the oak is devoid of leaves, some larvæ are to be found passing the winter, or what is usually termed "hibernating," on the twigs in a more or less dormant condition, and do not begin feeding again until the early buds appear in the spring.

I will now proceed to name some of the species which are associated with oak.

Among the butterflies, there is only one to be mentioned, *viz.*, *Thecla quercus*. I beat a number of the larvæ locally in the year 1910, and have since beaten odd ones. By locally, I, of course, imply Epping Forest.

Among the "clear-wings," also, there is only one, *viz.*, *Sesia cynipiformis*, the larvæ of which are to be found in oak stumps just under the bark.

I have just spoken of *Thecla quercus* and *Sesia cynipiformis* as being the only representatives among the butterflies and the clearwings. This applies not only to Epping Forest but to any part of the United Kingdom.

Among the Bombyces there are *Hylophila prasinana* and *H. bicolorana*, *Cossus ligniperda*, *Nola confusalis*, *Forthesia similis*, *Dasychira pudibunda*, *Orgyia antiqua*, *Pæcilocampa populi*, *Drepana falcataria*, *D. binaria* (*hamula*), *Stauropus fagi*, *Lophopteryx camelina*, *Notodonta chaonia*, *Phalera bucephala* and *Asphalia diluta*.

The larvæ of *Hylophila prasinana* and *H. bicolorana* both build a similar peculiarly shaped cocoon, which resembles an upturned boat.

The larvæ of *Cossus ligniperda* feed on the solid wood in the centre

of the tree, but there is no doubt that this larva finds oak wood too hard for its mandibles, and is consequently more often found in poplars and willows.

The larvæ of *Porthesia similis*, *Orgyia antiqua*, *Pæcilocampa populi*, and *Phalera bucephala* are gregarious in their early stages, whereas the larvæ of *A. diluta* pass their existence feeding between leaves. Most of you will no doubt associate the larvæ of *Phalera bucephala* with lime, but it is taken sparsely on oak.

Among the Noctuæ may be mentioned *Demas coryli*, *Acronycta aceris*, *Teniocampa gothica*, *T. incerta*, *T. stabilis*, *T. munda*, *T. pulverulenta*, *Anchoelid rufina*, *Cerastis vaccinii*, *Scopelosoma satellitia*, *Hoporina croceago*, *Diecylla oo*, *Calymnia trapezina*, *Hadena protea*, *Xylina ornithopus*, *Amphipyra pyramidea* and *Brephos parthenias*.

Of these *Demas coryli* and *Acronycta aceris* are, I believe, very seldom beaten out of oak, the former being most often found on beech and the latter on sycamore; also *Brephos parthenias* is more often associated with birch.

The Geometræ form quite an important section of the list and the following may be mentioned :

Uropteryx sambucata, *Metrocampa margaritaria*, *Eurymene dolobraria*, *Selenia lunaria*, *S. tetralunaria*, *Odontoptera bidentata*, *Eugonia alniaria*, *E. erosaria*, *E. quercinaria*, *Himera pennaria*, *Phigalia pedaria*, *Nyssia hispidaria*, *Amphidasys strataria*, *A. betularia*, *Boarmia gemmaria*, *B. roboraria*, *Tephrosia crepuscularia*, *Phorodesma pustulata*, *Hemithea strigata*, *Cubera pusaria*, all the *Hibernias*, *Anisopteryx ascularia*, *Cheimatobia brumata*, *Oporabia dilutata*, and *Eupithecia abbreviata*.

Although I have taken the larvæ of *Selenia lunaria* and *Eugonia erosaria* in Epping Forest, I have found both species decidedly scarce. In beating for the larvæ of *Phorodesma pustulata* special precaution should be taken. The branches should, in the first place, only be tapped gently, and if there are any larvæ of *pustulata* they will let themselves down by a silken thread and may easily be seen. The larva covers itself with chips of dead leaves, which it attaches to its body by means of a glutinous substance and is easily overlooked.

Mr. Hall gave a short account of those galls on oak which are due to the action of the flies of the Hymenopterous family *Cynipidae*. He dealt briefly with the life-history of various species and more particularly with the alternation of generations which is so largely characteristic of this group of insects.

June 3rd.—The decease of Mr. G. A. Pibel was announced.

EXHIBITS.—Mr. Burkill, leaves of *Populus nigra* galled by *Pemphigus marsupialis* on the mid-rib and by an unascertained species of *Pemphigus* on the petiole; both from Surrey.

COMMUNICATIONS.—Mr. Burkill stated that the willow twigs exhibited by him at the November meeting as being attacked by a sawfly had resulted in the breeding of *Euura atra* by the Rev. F. D. Morice. Mr. Bishop stated that the following plants were found around Thorpe and Chertsey on the occasion of the Archaeological extension to that district on May 17th, viz., *Saxifraga granulata*,

Ophioglossum vulgatum, *Geranium pratense*, *Valerianella carinata* (perhaps a garden escape), *Hydrocharis morsus-ranae* and *Hottonia palustris*. He also said that *Calla palustris*, one of the so-called Arum Lilies, occupies about an acre of Wisley Pond whence it was first recorded at least 12 years ago and appears to be increasing.

September 2nd.—Mr. Bishop, herbarium specimens of the following plants found by Mrs. Wilde and himself in Teesdale in July: *Thalictrum alpinum*, *Draba incana*, *Potentilla fruticosa*, *Astrantia helleborifolia*, *Helianthemum canum* var. *vineale*, *Peucedanum ostruthium* and *Bartsia alpina*. Mr. H. B. Williams, a specimen of *Sesia sphegiformis* taken near Oxshott in May—a new record for the Society's district; abs. *extensa-conjuncta* Tutt, and *intermedia* Tutt, of *Rumicia phlaeas*, and 2 males of *Agriades coridon* with thorax yellow on the underside, from the Chilterns in August.

COMMUNICATION.—Mr. H. H. Williams recorded the occurrence of a female specimen of *Grapta c-album* near Wendover, Bucks, in August, this species being usually confined to the western counties and Wales. Mr. Glegg recorded the Dartford Warbler in the Isle of Wight on May 8th.

DISCUSSION.—Mr. Hall opened a discussion on "Heredity and Environment," in which Messrs. Bishop, Dell, Nicholson, and Roberts took part.

October 7th.—EXHIBITS.—Mr. H. B. Williams, series of Butterflies to illustrate his paper, including *Pieris brassicae*, *rapae* and *napi*, showing ♂ with and without discal spot, ♀ with dusky brown suffusion at base of forewings, and the form, chiefly ♀, with transverse band joining the spots on the anterior wings; *Dryas paphia* abs. *valezina* and *sufusa*; *D. paphia* and *Grapta c-album* with light and dark undersides; series of British Satyridæ to show extremes of variation in spotting; *Loweia w-album* and its ab. *butlerowi*, *T. rubi* and its ab. *immaculata*; ten specimens each of *Loweia dorilis* and *Rumicia phlaeas* to illustrate the remarkable parallelism in variation; also series of Plebeiid "blues," upper and undersides; *Aglais urticae* ab. *ichnusa* and *Euchloë cardamines*. Mr. Riches, a specimen of *Deilephila euphorbiae* reared from a larva found in a trench at Arras by his son in 1918. Dr. Cockayne, *Colias edusa* and var. *helice* from Spain, and *Teracolus amata* and its pale female, illustrating Mendelian sex-limited inheritance; *Elymnias fraterna* ♀, mimic of *Danaüs plexippus* (both sexes), the ♂ being non-mimetic (Ceylon), also *E. casiphonæ*, both sexes with the model they respectively mimic, the Euplaine *Trepsichrois basilissa* (Java). Nearly all species of *Elymnias*, in both sexes or females only, mimic the distasteful species of their area. He remarked that great size and a curved costa characterise nearly all the non distasteful *Papilio*s of various groups found in the East Indies, for example, *Papilio demolition* (Java) and *P. pigoie* (Celebes), *P. polytes* var. *theseus* and *P. polytes* var. *pammon* (Celebes), *P. tereon* (Ceylon) and *P. milon*, *P. telephus* (Java) and its var. *celebensis*.

NEW MEMBER.—Mr. V. W. L. Daniel and Mr. B. T. Lowne were elected.

PAPER.—Mr. Harold B. Williams read a paper on "Parallelism in Variation in Butterflies" (printed in this volume pp. 13 to 17). The President and Messrs. Austin, Heath, Mera, Robbins and Tremayne took part in the ensuing discussion.

November 4th.—EXHIBITS.—Mr. H. B. Williams, *Polia chi* and var. *olivacea* reared from East Yorks ova: a spherical cocoon of *Saturnia pavonia* without the ordinary exit and containing parasites which had emerged from the pupa and died in the cocoon. Mr. Burkill, galls of *Pontania bridgemani* on *Salix fragilis* with puparia of the fly, *Dryophanta divisa* on *Quercus pedunculata* with flies, *Andricus ostreus* on *Q. pedunculata*, *Trigonaspis renum* on *Q. pedunculata*, *Rhabdophaga nervorum* on *Salix purpurea*, believed to be new to England; all from Derbyshire and Staffordshire.

COMMUNICATION.—Mr. Ross mentioned that at a meeting earlier in the year attention was called to the absence of certain galls usually common on the oak in the Society's district, notably those of *Andricus curator*, *Neuroterus baccarum* and *Biorrhiza pallida*. *Neuroterus tricolor*, which appears somewhat later than these, is quite as frequent as usual in the Chingford district of Epping Forest, but its alternate generation, *N. fumipennis*, seems rare this season, as are *N. lenticularis* and *numismatis*, whilst *N. laeviusculus* is less common than usual and *Andricus ostreus* is frequent, if not quite as common as usual. In N. Oxfordshire there seemed no shortage of *N. lenticularis*, *numismatis*, or *laeviusculus*.

LECTURE.—Mr. R. P. Howgrave Graham delivered an interesting and instructive lecture on "Chaucer's Pilgrim's Way," copiously illustrated with lantern slides, maps, and prints from the Ellesmere MS. The lecture was of varied and exceptional interest, and Mr. Howgrave Graham was warmly thanked by the Society.

December 2nd.—COMMUNICATIONS.—Mr. Ross recorded that he saw a bat flying about 1 p.m. at Chingford and another had been seen by Mr. Nicholson at Redhill about 1.45 on November 23rd; Mr. Burkill also saw many about 4 p.m. on the same day at Cobham. Mr. Burkill recorded *Biorrhiza aptera* ovipositing on an oak bud about 5 feet from the ground, the day being very warm.

PRESIDENT'S ADDRESS.—Dr. Cockayne chose for his subject "Wing Colour in Butterflies and Moths," and his address is printed in this volume on pp. 32 to 36.

PARALLELISM IN VARIATION IN BUTTERFLIES.

Read 7th October, 1919, by HAROLD B. WILLIAMS, LL.B., F.E.S.

This is a subject which, I fear, must be introduced with an apology. It is a fascinating one from many points of view, but I wish to shield myself in advance from those critics who, one supposes, may attack it as an instance of over-minuteness in the study of marking. Let me commence therefore by indicating some of the directions in which a study of this sort may be of value. *First*, I think it is of the greatest value to the student of phylogeny. Just as he is able, by examining the greater or less specialisation of an insect in its various stages, to determine its age as a species in relation to others, and by comparative work to determine the relative age and descent of groups (I avoid here the terms "family" and "genus" intentionally as neither conveys any exact meaning in this respect, and though "group" is even more vague in a sense, I hope to specify later the sense in which I use it, including at times only portions of genera, in others whole families or genera) so by a comparison of wing marking, to some extent in typical specific forms, but particularly in corresponding varieties, he is able to form an idea of the more primitive forms. *Second*, it is of value in determining specific relationships and *third*, it is of assistance in speculation as to the origin of markings. All these, I think, are truly scientific and useful objects, and premise (here we attack our supposititious critic on his own ground) an exact knowledge of particular marking, and of variation and its limits (even if it extend to only one spot).

Now there are three ways, I think, in which the study of this subject may usefully be approached. First, parallelism in variation of species, allied or otherwise. Second, in the two surfaces of the same species, and third, in forms of allied species varying in the direction of the wing marking of the typical form of each other.

First then let us take the cases in which allied species vary in similar manner and shortly discuss them, confining ourselves largely to the British Butterflies for convenience, and omitting altogether for want of time the interesting tropical cases of parallel mimetic variation.

I will endeavour to follow the ordinary sequence and take therefore the British Pierids—*brassicæ*, *rapæ*, *napi* first. In these I find the following forms of variation common to all three:—

♂ with or without discal spot on forewing.

Transverse band linking up the spots in ♀ (and rarely in ♂).

Suffusion of dark scales at base of wings.

It is to be noted the extreme forms are rarer in *brassicæ* than in the others.

The discal spot on the forewings of the ♂ is largely seasonal in *Pieris rapæ* and *P. napi*. In *P. brassicæ*, as far as I can ascertain, it is

purely aberrational and rare. In *P. rapae* and *P. napi*, one may say generally that the discal spot is characteristic of the second brood, noting that in English *P. napi* a faint spot is fairly common in spring examples, never so conspicuous as in the average summer specimens, and that in Irish examples these faint traces of a spot seem to be the rule, rather than the exception, and that the spot is even occasionally well-developed. In Ireland, however, the summer ♂♂ are frequently so much more extreme than English ones that even here there is practically no overlapping, and Irish ♂♂ exist with an inner marginal spot corresponding to that of the ♀, fairly well-developed. I exhibit specimens of all these forms to illustrate these remarks.

In *P. rapae* spring ♂♂ with discal spots do occasionally occur.

I have *P. brassicae* ♂♂ with discal spot, but only very faint and ill-developed.

The occurrence of a transverse band of suffused black scaling linking up the 2 spots of the ♀ occurs in all species and I exhibit specimens of each. The *P. brassicae* shown is not at all extreme. Specimens were in the collection of the late Mr. Harrison of Woodford with a complete dusky fascia right across the wing.

The suffusion of dark scales at the base of forewings is almost normal in *P. napi*, common in *P. rapae*, and rare in *P. brassicae*.

The parallelism in variation between *Euchloë cardamines* and its allies I have already referred to in my paper on that species. [See "Trans.," 1915, pp. 62 to 84.—Ed.] I will content myself here with noting the variation in size of the discal spot from a minute point to a conspicuous spot in, I think, all species, and the occurrence of a discal spot in the hindwing in *E. cardamines*, *E. euphenoides*, *Anthocharis tagis* var. *bellizina*.

Continuing the policy of confining this paper to reasonable limits by concentrating on British species, I pass over the genus *Colias*, which however tempts me to a lengthy digression on account of the number of orange species, with pale dimorphic forms of the ♀, as in our British *C. edusa* ab. *helice*.

The Argynnids give us numerous examples. *Brenthis selene* and *B. euphrosyne*, for example, both have forms with yellow, and with white ground colour (as also has *Argynnis aglaia*). Remarkably similar upperside aberrations with suffused and united spots also occur, and underside forms with the silver spots united are also found in both species.

In the larger Argynnids aberrations with united spots occur on remarkably parallel lines. The occurrence of forms of the ♀ similar to *Dryas paphia* ab. *valezina* I have not noticed, but suffused forms occur in *Argynnis aglaia* ♀, which it is suggested (Tutt, "Brit. Butts.," p. 290) is a parallel development to the *valezina* form of *D. paphia*. These are ab. *suffusa*, Tutt, but as very similar suffused forms occur in *D. paphia*, and also in *D. paphia* ab. *valezina*, one is at a loss to follow the reasoning of Tutt in this instance. The parallel variation is there, but has nothing to do with the *valezina* form, and one is inclined to regard these suffused forms as sex-limited aberrations confined to the

♀ rather than as dimorphic ♀ ♀. Whether or not the coloration of ab. *valezina* is also a sex-limited character is a question one must reserve for another time, merely noting that there are reasons for supposing that it is, and that the same applies to the pale ♀ ♀ of the Coliads.

In the Vanessids there are several examples of parallelism. Most striking are the extreme forms ab. *testudo* of *Eugonia polychloros*, ab. *ichnusoides* of *Aglais urticae* and the similar form of *Grapta e-album* of which Dr. Cockayne possesses the only example known to me. In all these forms the 3 normal costal blotches are united into one long stripe. These 3 species also show light and dark undersides to hindwings of remarkable similarity. *Pyrameis cardui* and *P. atalanta* have each a form (ab. *elymi* of *P. cardui*, and ab. *klemensiewiczii* of *P. atalanta*) which a comparison of the undersides show to be similar.

In the Satyrids the instances even among our British species are so numerous that a whole paper might well be devoted to them—in fact a most fascinating paper by the Rev. G. Wheeler on one aspect only of this has recently been published in the "Proceedings" of the South London Society. The fascination of this family lies in the fact that not only do the species of each genus vary in several directions on precisely similar lines, but the genera divide themselves into groups throughout which some form of variation is general, while other variations occur practically throughout the family. I propose to take the case of the occurrence of additional spots as an example for discussion. These occur in every British species, though in the case of the genus *Erebia*, and of *Hipparchia hyperanthus* it is difficult to fix on a form which one may take as typical in this respect. Extra spots occur: (1) above and slightly outside the apical eye spot; (2) directly below the apical eye spot; (3) in one or more of the three interneural spaces below it; (4) on the hindwings. Any of these forms may occur on upper, or under surface, though, of course, the two surfaces do not always normally correspond. To list the species in which each form of variation occurs would be of no value at the moment, and I will content myself with reference to certain forms which appear to me of outstanding interest.

Epinephela tithonus and *E. janira* (*jurtina*).

These two species vary on somewhat similar lines, particularly in the direction of excess spotting. *E. tithonus* normally has the apical eye-spot duplicated. The commonest aberration of *E. janira* in this direction reproduces this duplication. Both are prone to development of 2 extra spots on the forewings. Mr. Wheeler has recently pointed out ("Proc. South Lond. Ent. Soc.") that in the case of *E. tithonus* 2 extra spots are considerably more frequent than one. 2 extra spots are as common as one in *E. janira*, though extra spots are rarer in this species than in *tithonus*. Extra spotted forms of *janira*, it may be of interest to note, are common in the Belfast district, on the hills on the Antrim side of Belfast Lough.

When only one extra spot is present it is as often the lower as the upper in *janira*, as far as I am able to judge, more often the lower in

tithonus, as Mr. Wheeler has pointed out. Note here that the lower spot appears in a position where a large spot is normal in many *Satyridae*, e.g., in Britain in *Satyrus semele*, which produces the upper spot (between the 2 normal ones) as a rare aberration. I exhibit an example.

In *Coenonympha pamphilus* the extra spot (apart from duplication of the apical eye-spot, which is not uncommon), is, when it occurs, almost invariably the lower. I have no example of the development of the upper extra spot in *C. pamphilus*, and know of only one.

The extra spot above the apical is a common form in *Pararge megoera*. I have a ♂ specimen (exhibited) which has also an extra spot on the first neural interspace below.

In the smaller butterflies (*Lycænids* especially) we find much of interest. In the *Theclids* the obsolescence of the "hair-streak" mark is a form of variation common to most species. I exhibit *Thecla rubi* and its ab. *immaculata*, and *Loweia w-album* and its ab. *butlerowi*, as examples.

Parallel series of 8 aberrations of *Loweia dorilis* and *Rumicia phloeas* which I exhibit are remarkably similar. I have seen nothing in *L. dorilis* corresponding to ab. *radiata*, Tutt of *R. phloeas*, but most of the ordinary forms of aberration of ground colour and marking are represented.

The "Blues," especially the *Plebeiid* genera, are well-known for the remarkable parallelism of their variation. In fact a collection was formed especially to illustrate this by the late Dr. Hodgson. I exhibit 2 series—uppersides of *Agriades coridon*, *A. thetis*, *Polyommatus icarus*, and *Plebeius argus*, and undersides of *A. coridon*, *P. icarus*, and *P. argus*. Much more extensive series, of course, could easily be arranged, but want of space prevents it in my exhibit. The series of ♀ uppersides is perhaps most interesting. I refrain from discussing these in detail as I wish to deal with the other branches of the subject shortly.

Parallelism in marking of the 2 surfaces of butterflies is not common. Particularly it must be noticed that aberrations even of an extreme nature of one surface in an individual frequently show the other surface normal. In *Rumicia phloeas* for example, obsolescence, increase or striation of the spots on one surface is only rarely accompanied by a similar phenomenon on the other. The striate upperside I exhibit has a normal underside, and the striate underside a normal upperside.

In *Aglais urticae* every marking of the upper surface is reproduced by a marking of similar shape (but different colour, of course) on the under surface except the 2 "twin-spots" which do not occur on the under surface. Presumably the *ichnusa* form is the older, these 2 spots being a recent development. I exhibit ab. *ichnusa*, from Salisbury Plain, with no trace of these spots on the upper surface. In the *Satyridae*, in the case of extra spotting, although exactly similar forms occur on both surfaces, the 2 surfaces of any given insect by no means invariably correspond.

Of species varying in the direction of the normal marking of allied

species we have not many pronounced examples. *Euchloe cardamines* has a form (ab. *flava*, Williams) with a bright yellow ground colour approaching that of *E. euphenoides*. It also has a form, of which I exhibit the only British example I know of, with traces of a dusky shade between the white and orange spaces, as in *E. euphenoides* (ab. *umbrosa*, Culot). This appears normally to be a Syrian form.

The Coliads must here be mentioned again, the pale ♀ ♀ showing variation in the direction of normally pale species.

Aberrations of *Gonepteryx rhamni* have been recorded with traces of orange suffusion as in *G. cleopatra*.

In the "Ent. Rec.," vol. xxi., Mr. T. Reuss describes *Aglaia urticae* ab. *ioformis* and ab. *ioprotoformis*, in which the markings undergo a transition in the direction of those of *Vanessa io*. Forms of *V. io* tending in the direction of *A. urticae* also occur.

Many more examples might be collected among the *Satyridae* (*Erebia*) and *Lycaenidae*, but these would be of species normally very similar and in such cases it is difficult to separate such variation into categories showing variation of one species towards another, and variation of both in the direction of a presumed ancestral form.

I trust this paper will serve its real object, which is to stimulate a little thought on the subject sufficient to found a discussion.

ARCHAEOLOGICAL SECTION. REPORT FOR 1919.

The welcome return of Peace has enabled the Section to resume in some measure its usual activities.

Three excursions have been made during the year (a) to St. Giles's, Cripplegate, on 29th March, under the very competent guidance of Mr. Hopwood; (b) to Thorpe Church near Chertsey, on 17th May, and (c) a week-end excursion to Sherborne Minster, Dorset, on October 18th-20th.

Four meetings of the Section have been held at Salisbury House, viz., on 18th March, 20th May, 16th September and 16th December.

At the meeting on 20th May Mr. E. B. Bishop read a paper on Archaeological Rambles in the Cotswolds, and on 10th December Mr. Marshman Wattson gave a lantern lecture on the Stones of English History.

On 4th November, at the instance of the Section, Mr. R. P. Howgrave-Graham gave a lantern lecture on Chaucer's Pilgrims' Way to the whole Society.

The Record of the visit to St. Giles's, Cripplegate, has been placed in the library, and a record of the inspection of Thorpe Church is in course of preparation.

To the keen regret of the Section Mr. Marshman Wattson resigned the Recordership, and at a Committee Meeting on 4th September it was decided to ask Dr. W. Simpson to accept the office. Dr. Simpson has since expressed his willingness to act, provided he has the active support and assistance of the Section. An interesting series of suggestions for the compilation of Records has been framed by Dr. Simpson.

E. B. BISHOP, *Chairman.*

REPORT OF BOTANICAL SECTION FOR 1919.

There is nothing of absorbing interest to report for the year just ended. We are glad to welcome back those members who, during the war, have been on active service, but owing to the necessarily slow process of demobilisation such members have not yet been able to render much assistance to the Section. To most of us the coming of peace, welcome as it has been, has resulted in greatly increased business strain and pressure, and consequently diminished opportunities for botanical work.

The Sectional Meetings have been only moderately well attended.

The Excursion to Leatherhead, on June 21st, was expanded into a week-end, the headquarters being the "Old Running Horse" Inn, Leatherhead. Nine members and friends made up the party, and a thoroughly successful and enjoyable time was spent. Several local and interesting plants were observed, the most noteworthy being *Cynoglossum montanum*, still growing freely in its old habitat, well within the Society's district.

The afternoon excursion to Harefield, Middlesex, on July 26th, though poorly attended, was a distinct success. Several of the local plants recorded by Trimen and Dyer still survive and flourish in this delightful corner of the metropolitan county.

The Society as a whole, and the Botanical Section in particular, has greatly benefited by the most valuable bequest of our lamented colleague, Mr. C. S. Nicholson. The excellent set of beautifully bound volumes of the "Journal of Botany" will be invaluable for research purposes, to which must be added the many volumes of Local Floras and other standard works. The Nicholson Herbarium bequest includes a mass of material to which much time and labour will have to be devoted before its full value can be adequately realised.

Several useful lists of plants found in the Society's district have been sent to the Recorder during the year, mostly for the Southern portion. Special thanks are due in this connection to the Rev. P. H. Cooke and Mr. L. J. Tremayne.

Sixty-nine new species have been added during the year to the records for the Southern portion, the most noteworthy being the following:—

Ranunculus sardous, Craitz.

Cochlearia anglica, L.

Cerastium arvense, L.

Pyrus torminalis, Ehrh.

Saxifraga granulata, D.

Aster Tripolium, L.

Anthemis nobilis, L.

Artemisia maritima, L.

Glaux maritima, L.

Anagallis foemina, Mill.

Cynoglossum montanum, L.

Verbascum lychnitis, L.

Lamium hybridum, Vill.

Plantago maritima, L.

Chenopodium urticum, L.

Mercurialis annua, L.

Hydrocharis Morsus-ranae, L.

Convallaria majalis, L.

Lemna trisulca, L.

Triglochin maritimum, L.

Carex divisa, Huds.

Brachypodium pinnatum, Beauv.

Lastrea spinulosa, Presl.

Lists of plants from any part of the district, north and south, with exact localities, stating the sub-district and date of observation with specimens (other than those of the most common species) whenever possible will be much appreciated by the Recorder. Members of other Sections are specially asked to help in this manner.

R. W. ROBBINS, *Chairman.*

C. L. WILDE, *Secretary.*

January, 1920.

LEPIDOPTERA SECTION—REPORT FOR 1919.

The Section cannot yet claim to have restored the standard of this branch of the Society's work to that existing prior to the war, but the attendance at the meetings and the interest of exhibits have shown an improvement. The average attendance at Sectional meetings has been $7\frac{3}{4}$ as against $4\frac{1}{2}$ last year, and the average has shown a steady improvement throughout the year. There are still, however, many members who have not resumed attendance.

Eight meetings have been held at Salisbury House and two Field meetings.

Notable exhibits include :—

Sphinx ligustri with black central stripe on body and forewings suffused with chocolate.—Mr. R. T. Bowman.

Eumecia phloeas abs. *eleus* (Berkhamstead) and *obsoleta* (Limbr.), Dr. E. A. Cockayne; abs. *alba* (Teignmouth and Missenden), *intermedia*, *obsoleta*, *radiata*, *suffusa*, *eleus*, *infra-extensa*, *infra-radiata*, *extensa-conjuncta*, *remota*, etc., Mr. H. B. Williams; abs. *suffusa* and *intermedia*, Mr. C. H. Williams; abs. *radiata* (Finchley), *obsoleta* (Darenth), *suffusa* (Bexley), Mr. V. E. Shaw.

Xanthia ocellaris and abs. *gilvescens* and *intermedia*, Mr. H. W. Wood.

Agriades coridon, a leaden male, Mr. C. H. Williams.

Anaitis plagiata, an extreme melanic form, and *Acronycta menyanthidis* with dark border to forewings (both from Dumbartonshire), Dr. E. A. Cockayne on behalf of Mr. R. Horn, of Glasgow.

A very successful exhibition of living autumn larvæ was held on September 16th.

One species, *Sesia sphegiformis*, has been added to the list of Lepidoptera occurring in the Society's district.

E. A. COCKAYNE, *Chairman*.

HAROLD B. WILLIAMS, *Secretary*.

November 18th, 1919.

REPORT OF THE ORNITHOLOGICAL SECTION FOR 1919.

1. During the year the Section was glad to welcome back on demobilization, Messrs. Glegg, Bayne and Collenette, the latter, unfortunately, shortly afterwards having to return to the East to resume his duties there. The number of members belonging to the Section is now upwards of thirty, of whom, however, only about a third are active. The officials for the ensuing year elected at the Annual Meeting of the Section, held on November 18th last, are as follow:—Mr. W. E. Glegg, *Chairman*; Mr. S. Austin, *Secretary*; Mr. A. Brown, *Recorder*; together with Mr. P. J. Hanson. The thanks of the Section are due to Mr. L. J. Tremayne for undertaking the work of recording during the past two years.

2. The Committee of the Section arranged for a Paper for the Syllabus, viz.: on April 15th, by Mr. J. E. S. Dallas, entitled "Bird Notes from South-East England." Four meetings of the Section have been held, at three of which Papers were read, viz.:—On June 17th, by Mr. A. Capleton, on the "Motions and Attitudes of British Birds on the ground"; on October 21st, by Mr. H. C. Playne, M.A., on "Some Problems suggested by the Song of Birds"; and on November 18th, by Mr. P. W. Horn, on "Notes on the Young of some British Birds." Three Field Meetings were held as follows:—On May 25th, conducted by Mr. J. E. S. Dallas, to the district round Warlingham; on July 5th, conducted by Miss G. M. Towsey, to Petersham Park, Ham Common and Richmond Park; and on November 30th, conducted by Mr. S. Austin, to Canvey Island. In addition six meetings of the Committee were held. A Paper was also read before the Chingford Branch, on October 18th, by Mr. A. G. Hubbard, B.Sc.,

on "British Birds' Nests." The Section would like to place on record its appreciation of the work of our old member, Captain Oliver G. Pike, R.A.F., in discovering and photographing the breeding place in Hertfordshire of the Black-necked Grebe (*vide* "British Birds," November, 1919), and to welcome him back to the Society.

3. The Report on the Birds of Epping Forest has been continued and is printed elsewhere in the Transactions. Attention is drawn to the new form in which these notes will appear in future. Records from members, and others, will be welcomed.

4. The Society's local district map, referred to in paragraph 6 of last year's Report, has now been printed and placed on sale at 6d. per copy. All members of the Society are urged to obtain a copy.

5. Thirty-two birds have been ringed during the year under the "British Birds" Marking Scheme. Two recoveries have been reported, *viz.*:—Song Thrush, ringed at Woodford Green, Essex, on May 7th, 1919, recovered at same place on June 6th, 1919 (bird found dead); and Redbreast, ringed at Woodford Green, Essex, on March 4th, 1919, recovered at Woodford Wells, Essex, on April 6th, 1919. It is hoped that this important branch of the Society's activities will be more in evidence in future.

6. The collection of photographs of birds and nests has been increased by the addition of a number of Mr. P. J. Hanson's photographs.

9. The total numbers of different species of birds and nests, recorded in the various sub-divisions, since the scheme was started, up to the end of 1919, are as follows:—

NORTHERN DISTRICT.

		Birds.		Nests.	
No.					
1.	Colnbrook ...	...	44	...	5
2.	Rickmansworth ...	...	65	...	30
3.	Hounslow ...	...	71	...	12
4.	Harrow ...	...	80	...	33
5.	Mimms ...	...	41	...	10
6.	Hampstead ...	...	108	...	46
7.	Enfield Chase ...	...	95	...	35
8.	Lea Valley ...	...	116	...	42
9.	Epping ...	...	126	...	78
10.	Hainault ...	...	68	...	52
11.	Brentwood ...	...	75	...	46
12.	Rainham ...	...	57	...	49

SOUTHERN DISTRICT.

		Birds.		Nests.	
1.	Weybridge ...	...	7	...	2
2.	Wimbledon ...	...	62	...	5
3.	Chessington ...	...	17	...	3
4.	Norwood ...	...	18	...	—
5.	Banstead ...	...	32	...	2
6.	Caterham ...	...	42	...	15

Southern District—contd.

	Birds.	Nests.
7. Holmesdale ...	41 ...	2
8. Blackheath ...	38 ...	4
9. Kent Marshes ...	1 ...	—
10. Darenth ...	5 ...	2
11. North Downs ...	13 ...	—
12. Westerham ...	6 ...	1

For the Northern district, twenty-four new records and nine new nesting records have been entered for the various sub-districts during the past year; and for the Southern district, twelve new records and twelve new nesting records have been so entered for the same period.

8. Five species new to our district have been recorded, making the total number 157. These new occurrences are :—*Anthus petrosus* (Rock Pipit), at Grays, Essex, probably in 1908, recorded by Mr. P. W. Horn (per S.A.); *Phoenicurus titys* (Black Redstart), ♀ at Thornton Heath, Surrey, October 21st, 1910, recorded by Mr. P. W. Horn (per S.A.); *Oenanthe oe. leucorrhoa* (Greenland Wheatear), Grays, Essex, September, 1907 (skin in possession of Stepney Museum and identified by Mr. F. J. Stubbs in 1909), recorded by Mr. P. W. Horn (per S.A.); *Spatula clypeata* (Shoveller), three on Birch Hall Pond, Theydon Bois, Essex, April 20th, 1919, recorded by Mr. F. J. Stubbs (per S.A.); *Larus marinus* (Great Black-backed Gull), two on the Roding, near Ilford, April 29th, 1918, recorded by Mr. C. Murray.

9. Other interesting records are as follows:—*Corvus cornix* (Hooded Crow), Fairmead Bottom, Epping Forest, November 2nd, 1919, reported by Mr. W. E. Glegg, and West Thurrock, December 9th, 1919, reported by Mr. P. W. Horn (per S.A.); *Pica pica* (Magpie), pair seen near High Beach, Epping Forest, August, 1918, reported by Miss A. Hibbert-Ware (per A.B.); *Passer montanus* (Tree Sparrow), Chingford Plain, July 20th, 1919 (W.E.G.), Whitehall Plain, October 5th, 1919, (J.R.); *Fringilla montifringilla* (Brambling), Warlingham, January 5th and 19th, 1919, Kew, January 9th, 1919, reported by Mr. J. E. S. Dallas (per S.A.), Debden Slade, Epping Forest, April 3rd and 8th, 1919, reported by Mr. P. D. Hayward (per S.A.), and Dagenham Lake, October 5th, 1919, reported by Mr. P. W. Horn (per S.A.); *Acanthis linaria cabaret* (Lesser Redpoll), Finsbury Park, London, "saw and heard a pair on June 8th, 1919; on July 20th again saw a pair and from their behaviour came to the conclusion that they had nested in the park," reported by Mr. R. Hay Fenton (per S.A.); *Emberiza calandra* (Corn Bunting), Chelsham, Surrey, in song, February 16th, 1919, reported by Mr. J. E. S. Dallas (per S.A.); *Saricola rubicola* (Stonechat), High Beach, Epping Forest, March 28th, 1911, September 15th, 1913, March 17th, 1914, and September 24th, 1914, Fairmead Bottom, Epping Forest, September 20th, 1912, and September 26th, 1913, reported by Mr. P. D. Hayward (per S.A.); *Lanius excubitor* (Great Grey Shrike) Warren Plain, Epping Forest, December 25th, 1919, reported by Mr. W. E. Glegg—"The bird had perched in characteristic Shrike manner on the topmost twig of a tree. After settling on the highest point of another tree, the Shrike disappeared

into the private grounds of the Warren" (see "British Birds," p. 146, November, 1919, and "Essex Naturalist," page 142, Part II., volume xix.); *Oenanthe oenanthe* (Wheatear), Warren Hill, Epping Forest, August 14th, 1912, High Beach, Epping Forest, September 9th and 19th, 1913, and April 15th, 1915, reported by Mr. P. D. Hayward (per S.A.), Whipp's Cross, Walthamstow, April 18th, 1919, reported by Miss A. Hibbert-Ware (per A.B.), Ilford, May 6th, 1919, reported by Mr. C. Murray; *Alcedo ispida* (Kingfisher), near Staples Hill, Epping Forest, nested and brought off young, June 14th, 1915, reported by Mr. P. D. Hayward (per S.A.); near Woodford Green, nested and brought off young, May, 1919, reported by Mr. H. C. Playne, (per S.A.); *Carine noctua* (Little Owl), between Higham's Park and Chingford, July 20th, 1919, reported by Mr. W. E. Glegg, Enfield, July 18th, 1919, reported by Mr. P. J. Hanson; *Buteo buteo* (Buzzard), Ilford, June 11th and November 25th, 1919, reported by Mr. C. Murray; *Scolopax rusticola* (Woodcock), near "Robin Hood," Epping Forest, October, 1919, reported by Mr. P. D. Hayward (per S.A.); *Tringa alpina* (Dunlin), West Thurrock, Essex, December 18th, 1919, reported by Mr. P. W. Horn (per S.A.); *Totanus hypoleucis* (Common Sandpiper), Connaught Water, Epping Forest, May, 1917, reported by Mr. P. D. Hayward (per S.A.), River Roding, near Ilford, May 21st and September 3rd, 1919, reported by Mr. C. Murray, New River, Bush Hill Park, September 7th, 1919, reported by Mr. P. J. Hanson; *Charadrius apricarius* (Golden Plover), in considerable numbers by River Roding, near Woodford, February 1st, 1919, reported by Mr. H. C. Playne (per S.A.), River Roding at Theydon, February 15th, 1919, reported by Mr. L. J. Tremayne.

10. The thanks of the Section are due to those members of the Society who have assisted it in its work, and also to the following friends, to whom it is indebted for many interesting records and notes, viz.:—The Misses A. Hibbert-Ware and G. M. Towsey, and Messrs. J. E. S. Dallas, R. Hay Fenton, P. W. Hayward, H. C. Playne, F. J. Stubbs, W. F. Stevens, and T. M. Blagg.

For the Ornithological Section,

A. BROWN, *Secretary*,

December 31st, 1919.

EXTRACTS FROM MINUTES OF ORNITHOLOGICAL SECTION.

April 15th, 1920.—PAPER.—Mr. J. E. S. Dallas read "Bird Notes from South-East England," illustrated with lantern slides. The districts treated of were Dungeness and Warlingham, and a number of interesting species were referred to from both localities. A slide of the nest of the Common Tern showed pieces of wood arranged about the nest, and the lecturer stated that this was frequently found to be the case. He suggested that they might serve as identification marks for the nesting birds. A very fine photograph of the Little Owl was shown and a description given of the love flights of the Nightjar.

May 25th, 1919.—FIELD MEETING.—Worlingham, Surrey. Leader, Mr. J. E. S. Dallas. 32 species were identified. Nests found; Yellow Bunting, 3 eggs; Tree Pipit, 3 nests, 5, 6 and 2 eggs

respectively; Wryneck, nesting hole found; Nightjar, 2 eggs; Little Owl, nest with empty egg-shell.

June, 17th, 1919.—PAPER.—Mr. A. Capleton read a paper on "The Motions and Attitudes of British Birds on the Ground." The lecturer divided his paper into three parts. (1) Those birds frequently seen on the ground and obtaining the whole or a part of their food there. (2) Birds obtaining only a part of their food from the ground and only occasionally to be seen there; and (3) Birds rarely, if ever, seen on the ground. Mr. Capleton gave a detailed account of various species of birds and their actions arranged under these three headings.

July 5th, 1919.—FIELD MEETING.—Richmond and Petersham Park and Ham Common. Leader, Miss G. M. Towsey. Thirty species were identified, among the more interesting being Whinchats and Great Crested Grebe in Richmond Park, Red-backed Strike on Ham Common, and Nuthatch heard frequently in Petersham Park.

October 21st, 1919.—COMMUNICATIONS.—Mr. Glegg reported that in company with other members of the Section, and under the guidance of Mr. O. G. Pike, he had recently had the opportunity of observing the Black-necked Grebe in Hertfordshire. Mr. Hanson, who had also seen this species, remarked that the most striking feature of the bird was its red eye. He also reported the Grasshopper Warbler at Tring, and stated that Martins were still to be seen at Bush Hill Park, Enfield, on October 7th last. Mr. Dallas stated that the Magpie had increased recently in the Warlingham district.

PAPER.—Mr. H. C. Playne, M.A., gave an address on "Some Problems suggested by the Song of Birds." A diagram of the vocal apparatus of a bird was shown, and the mechanism explained, and the lecturer stated that bird song could not be expressed by musical notation. Some of the problems to be solved were—How do birds learn their song? Do our migrant birds sing in the lands from which they come? Are there any reasons for song? Is song stimulated by anger or excitement? One of the most moving things in connection with bird song was the early morning chorus which went all round the world just in front of sunrise. A vigorous discussion followed.

December 18th, 1919.—COMMUNICATIONS.—Mr. P. W. Horn, Curator of the Stepney Borough Museum, reported a Chiffchaff singing in St. George's Recreation Ground, Stepney, on September 17th.

EXHIBITS.—Mr. Horn showed a small interesting collection of bird skins, some of which were from the Society's local district, viz., Common Crossbill, Keston, Kent; Black Redstart, Thornton Heath, Surrey; Greenland Wheatear, West Thurrock, Essex; Greenshank, Ribbleside, Essex.

PAPER.—Mr. Horn communicated some original and extremely interesting "Notes on the Young of some British Birds," in which he

narrated his experiences in rearing the young of a number of species and describing the method of feeding, etc., adopted. The characters of various nestlings were described, and amongst other subjects dealt with were alarm notes and song, mimicry and instinct.

November 30th, 1919.—FIELD MEETING.—Canvey Island, Essex. Leader, Mr. S. Austin. Thirty-two species were identified, the Ringed Plover, Golden Plover, and Curlew being the most interesting of those observed.

REPORT OF PLANT GALL SECTION, 1919.

Two Papers were contributed to the Society during the year, *viz.* :—On March 4th on "Sawfly Galls," by Mr. H. J. Burkill; and on May 6th on "Oak Galls," by Mr. L. B. Hall.

A fair amount of work seems to have been done by the various members of this Section, but up to the time of writing these members seem to have been unable to compile the results of their observations so that most of the details have necessarily to be held over for the present.

Some of the members joined in expeditions with other Sections, in this way combining Archaeology or Botany with their own special subject. The early summer outings to Thorpe, Surrey, and Epping Forest showed that there was a great scarcity of the spring forms of Oak Galls, the only plentiful species in Epping Forest being *Spathegaster Aprilinus*. Flies thought to be of this species were observed ovipositing in the mid-ribs and lateral veins on the under-side of Oak leaves.

This scarcity of species has been continued in the corresponding forms in the Autumn, and a good deal of material has been collected for comparison with observations in the coming year.

Andricus curvator, Hartig. Remains of a few seen near Oxshott, November; also in Derbyshire and Staffordshire, October. No fresh ones seen in early summer on west or south-west side of London.

A. curvator, form *collaris*, Hartig. Remains seen in winter on Wimbledon Common.

A. gemmatus, Adler. Dead galls plentiful on one tree on Putney Heath in winter; also seen in Kingston Vale.

A. gemmatus, form *corticis*, Linn. No fresh ones seen near London one group of cells noted in Derbyshire.

A. inflator, Hartig. Dead ones noticed on Wimbledon Common in winter.

A. inflator, form *globuli*, Hartig. Not noticed.

A. trilineatus, Hartig. One twig with old galls, Wimbledon Common, in the winter.

A. trilineatus, form *radicis*, Fbr. Not seen, though searched carefully for where it used to be frequent on Wimbledon Common.

A. pilosus, form *fecundator*, Hartig. A few on Weybridge Heath.

Biorrhiza pallida, Oliv. Only one fresh one seen, near Hounslow;

a few old ones noted during the winter on Wimbledon Common, Esher Common, and Weybridge Heath.

B. pallida, form *aptera*, Bosc. Wimbledon Common, a few. Failed to find it in its old haunts in Richmond Park.

Trigonaspis megaloptera, form *renum*, Hartig. Two lots found near Stanton, Staffs. Not seen elsewhere.

Neuroterus albipes, form *laeviusculus*, Schrök. One good colony on Wimbledon Common. A few found in Derbyshire.

N. baccarum, Linn. Not noticed on the west or south-west of London during the spring. Was also very scarce the previous year.

N. baccarum, form *lenticularis*, Oliv. A few on Weybridge Heath and in Derbyshire. Several trees attacked near Stanton, Staffs.

N. tricolor, form *fumipennis*, Hartig. A few in Dovedale, Derbyshire, fairly frequent near Stanton, Staffs. A few on Weybridge Heath.

N. vesicator, Schl. A few old ones noted in the Autumn on Weybridge Heath, and one record from Wimbledon Common.

N. vesicator, form *numismatis*, Oliv. A few, Wimbledon Common, Weybridge Heath, and Derbyshire. Several leaves attacked near Stanton, Staffs.

Dryophanta divisa, Hartig. Stanton, Staffs., plentiful. Could not find this species, or *longiventris* or *folii* where they used to be frequent on Wimbledon Common.

Neuroterus Aprilinus, Girand. Plentiful in Epping Forest, May 25th; flies had emerged and the galled buds were mostly "spotted" owing to the exit holes. Some flies were seen ovipositing in the veins on the underside of the oak leaves.

Neuroterus ostreus, Girand. Plentiful on Weybridge Heath. Also seen, Wimbledon Common, Walton on the Hill, Oxshott, and Derbyshire, but not as plentiful in the last named as it was in 1914.

Andricus solitarius, Fousc. Weybridge Heath, November.

A. albopunctatus, Sch. Several galls on the usual tree beyond Bedford, June. A few in Epping Forest.

Cynips Kollari, Hartig. Generally distributed.

Callirhytis glandium, Girand. Kew Gardens, several galled acorns under one tree.

The various species of Oak Galls that are not mentioned above have not been observed during the year.

Pemphigus galls were common on *Populus nigra* in Epping Forest and near Teddington on 25th and 31st May respectively, and the early appearance of the spirally-twisted petiole gall has caused the opinion to be expressed that the species is *P. protospirae*, Licht., and not *P. spirothecae*, Pass., as the latter is autumnal. It is to be hoped that this point will be settled this year as the early species does not seem to have been hitherto recorded as British.

Eriophyes triradiatus, Nal., continues to spread rapidly round London, especially on the western side.

Rhabdophaga nervorum, Keiff., was recorded from Derbyshire (H.J.B.) in October on *Salix purpurea*, Linn. A fresh host plant record for Britain.

Urophora solstitialis, Linn., was recorded on *Centaurea scabiosa*, Linn., by Mr. Tremayne, from Surrey and Somerset, which appears to be a fresh host plant record for Britain.

The gall recorded by Mr. L. B. Hall (Houard, No. 7372) as occurring on *Galium Mollugo*, Linn., in West Sussex, 1918, was found to be well established on *G. verum*, Linn., in the neighbourhood of Leatherhead and Box Hill on June 21st. *Eriophyes ilicis*, Can., on *Quercus Ilex*, Linn., *E. convolvens*, Linn. and *Gymnosporangium clavariaeforme*, Jacq., were also recorded the same day from near Leatherhead, while later on in the afternoon *Oligotrophus Leemei*, Keiff., was found on *Ulmus glabra*, Huds., near Mickleham. It was reported in September from Staffordshire (H.J.B.) on the same species.

The Sawfly—*Euura atra*—whose larvæ live in the pith of willow stems and may cause a slight swelling in the thinner twigs, though hardly enough to be classed as a gall, was found in large numbers on *Salix fragilis* on the Surrey bank of the river from Kew Bridge to Hammersmith Bridge, and was kindly identified by Rev. F. D. Morice.

CHINGFORD BRANCH—REPORT FOR 1919.

The interest in the Branch has been well maintained and, in order to increase its activities, it was decided, at the last meeting in the year, to form a local committee.

The largest attendance at the meetings was 35 and the smallest 15; the average being about 25.

Papers or lectures were given as follows:—"Some Aspects of Migration," by J. F. Stubbs; "The Colours of Flowers," by R. W. Robbins; "Notes on a Naturalist's voyage round the world," and "Snakes and Lizards," by E. Samuelson; "Some Oak Galls," by J. Ross; "British Birds Nests," by A. G. Hubbard, B.Sc.; "Wayside Notes," by L. B. Hall.

The Branch also had two Microscope evenings, an innovation which was much appreciated. They unfortunately lost the services of their excellent chairman, Canon Russell, who has left the neighbourhood, but his place has been taken by Mr. A. G. Hubbard, B.Sc. The Local Secretary is E. Samuelson, 89, The Ridgeway, Chingford. E. 4.

COUNCIL'S REPORT FOR 1919.

(PRESENTED AT THE ANNUAL MEETING, 2ND DECEMBER.)

Though a year has elapsed since hostilities ceased, the period since our last Annual Meeting has been a difficult one for the Society, and your Council again appeals for the cordial support of all members to increase interest in the meetings and also to enlarge the Society's membership. It is with much pleasure that we have welcomed back those of our members who have been on service, and it is satisfactory to note that many of them have resumed an active part in the work of the Society. Over four years of war have been a severe test of the loyalty of our members, but the trial has been faced, and though we have to confess that the Society has been weakened in membership we may confidently say that a recovery has commenced, and that we hope soon to see the several branches of our work favourably progressing. We have, however, to leave our convenient quarters here at Salisbury House, but fortunately we have been able to find accommodation at Winchester House, Broad Street. We shall have to pay a higher rent at Winchester House and as the finances of the Society are not robust the question of an increased subscription may have to be faced. It is a possibility also that we may have to curtail the number of Sectional Meetings that we can hold. Your Council would take this opportunity of recording to the owners and officials of Salisbury House its warm appreciation for the generous and courteous treatment given to the Society.

The reorganisation that has been and is yet necessary to get the Society into full working order has taken much of the time available for Council Meetings, and important proposals for the re-constitution of the Council in order to give Sections direct representation on that body and to keep officers of Sections in close touch with the Council have been but partly considered.

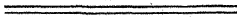
Early in the year Mr. Ross, who had been one of the Society's Secretaries since its formation, had to resign through business pressure and indifferent health, and after some difficulty a successor was found in Mr. Vernon Stuart. The Council desires to place on record its appreciation of the inestimable services rendered to the Society by Mr. Ross. It would not be easy to find words to adequately express the value of his work.

The List of Officers nominated for election to-night will show that we are losing the services of Dr. Cockayne as President. That Dr. Cockayne for five troubled years has been our head gives cause for thankfulness, for his scientific attainments and sound guidance in critical situations have been a great asset to the Society, as those in touch with him thoroughly appreciate.

The difficulties of the Society are by no means overcome, but

having survived the war years we hope for an era of increased membership and for renewed enthusiasm to give us opportunities of realising the hopes formed at the time of the amalgamation in 1914.

The Council appeals to members who may have unwanted copies of the 1915 vol. of Transactions to present such copies to the Society, as the stock of that year's issue has become exhausted.



THE LONDON NATURAL HISTORY SOCIETY.

TREASURERS ACCOUNTS FOR THE YEAR 1919.

GENERAL ACCOUNT:

[illegible]

LIFE COMPOSITION ACCOUNT:

By 1918 Balance	£	s.	d.			
„ „ 1919 Interest on Exchequer Bonds	..	..	..	..	..	..
„ „ 1919 Interest to General Account	..	..	..	..	..	..
„ „ Balance	..	..	..	..	..	..
	£15	18	0			
	£	s.	d.			
1919 To Interest to General Account	..	..	..	..	..	..
„ „ Balance	..	..	..	..	..	..
	£15	18	0			

PUBLICATION ACCOUNT:

[illegible]

CABINET ACCOUNT.

	£	s.	d.
By 1918 Balance ..	..	..	2 17 6
" " Donation ..	..	..	0 7 5½
			<hr/>
Balance to 1920 ..	3	4	11½

Audited and found correct :
LEWIS EYNON | Hon. Auditors.
J. Ross |

F. G. DELL,
Hon. Treasurer.

WING COLOUR IN BUTTERFLIES AND MOTHS.

(Read at the Annual Meeting, December 2nd.)

The Theory of Natural Selection put forward by Darwin and Wallace more than half a century ago, and amplified by their successors, explained the meaning of so much that was formerly obscure in the wing colouring and pattern of the Lepidoptera, that for a long time it was accepted by the majority of naturalists as a complete and final explanation.

The object of my address to-night is to show that in some respects it is incomplete and unsatisfactory. I think no one doubts that the underside colour and pattern of all our native butterflies and of those moths which rest with wings opposed in butterfly fashion, such as *Selenia* and *Bupalus*, are coloured to resemble their surroundings and to obtain protection against their enemies. Protective resemblance is also provided by the upperside colour of all four wings in those moths which sit in exposed situations with wings outspread such as the *Boarmidae* and *Eupitheciidae*.

In those in which the uppersides of the forewings only are exposed in the resting position, such as most *Noctuidae*, these are protectively coloured, and the hindwings have a dull colour with little or no pattern in the majority of cases.

Most of the butterflies on the contrary have a bright and conspicuous colour scheme on the upperside. It is this which it is so difficult to explain satisfactorily.

Observation has proved that butterflies, when they are on the wing, are comparatively immune to the attacks of birds. This observation applies almost equally to the butterflies of both temperate and tropical regions, although a few birds do habitually prey on them at such a time.

Birds are the only possible enemies (common to all regions) of importance to a butterfly flying in the open. Therefore it might be argued that since they are so seldom attacked when their upperside is exposed the colour and pattern displayed is in no way protective, but has developed unmodified by the action of natural selection. Apart from the fact that it is difficult to believe that such elaborate patterns could have developed in a fortuitous way, we should expect to find the uppersides of the hindwings of moths exhibiting similar brilliant colours and conspicuous patterns. We should expect it also in the case of the undersides of moths, were it not that this is exposed during the most critical period of their lives, while they are drying their wings. We can understand the need of inconspicuous colours on the underside, although it is only exposed for a short period. As an actual fact we find that very few moths have bright colours on the upperside of the hindwings. The majority of those which do so are day-flying species. Too high a proportion of day-flying moths are

brightly coloured for this to be an accident, and they belong to groups too widely separated for it to be accounted for on grounds of affinity. Of our native *Geometrae* we may cite *Bupalus piniaria*, *Fidonia* (*Macaria*) *limbaria*, *Pseudopanthera macularia*, *Eulype hastata* and *Odezia atrata*; of our *Noctuidae*, *Agrophila trabealis*, *Acontia luctuosa*, *Euclidia mi*; of *Bombyces*, *Diacrisia sanio*, *Parasemia plantaginis* and *Saturnia pavonia*. In the case of many day-flying *Noctuae* the upperside of the forewing is protectively coloured, that of the hindwing brightly coloured. Examples are: *Anarta myrtilli* and *A. cordigera*, *Heliothis tenebrata* and *Euclidia glyphica*. *Brephos parthenias* and *notha* are further instances and are now regarded as *Geometrae*.

If we look for similarly coloured insects amongst the nocturnal species we find a very much smaller percentage in the British Isles, chiefly in the genera *Catocala* and *Triphaena*. *Triphaena* is readily disturbed by day and *T. interjecta* has a regular daylight flight in the afternoon. *Catocala*, too, is readily disturbed by day. Some of the tropical *Catocalidae* are even more ready to fly in the sunshine; for instance, the genus *Spirama* with peacock eye-spots.

These facts make it probable that there is some real advantage to be obtained by the display of a bright and conspicuous pattern in flight. This advantage, of course, cannot be obtained by nocturnal species.

The crepuscular butterflies with which I am acquainted, *Amathusia*, *Melanitis*, and some of the *Hesperidae*, are dull coloured like nocturnal moths, as are many of the *Satyridae* which fly in the shade of deep forests in the Tropics.

It will be noticed that I have left out of my list of bright coloured diurnal moths the *Zygaenidae*, *Callimorpha*, *Euchelia jacobaeae*. It is well established that these are protected to a varying degree from various enemies by distasteful qualities. Such protected species are conspicuous both at rest and in flight and as a rule are sluggish. In the Tropics large and important groups are protected in this way from birds. In various areas distasteful species of widely different groups have similar colour and pattern and form Müllerian groups, and in other cases distasteful species are mimicked by edible ones forming examples of Batesian mimicry. All these fall outside the present discussion.

Other species with a bright colour or conspicuous pattern are quite inconspicuous when at rest in their natural surroundings, as, for instance, some hawkmoths and the emeralds; or they resemble a conspicuous inanimate object, like *Ulix glaucata*, which looks like a bird-dropping.

Such insects, which appear conspicuous in the cabinet, are just as much protectively coloured as those which resemble part of a rock or tree-trunk. If we take it as proved that the bright colours of the edible diurnal *Lepidoptera*, which form the great majority, are not fortuitous, but have been evolved for some definite purpose, the question arises as to what this purpose is. In some cases of sexual dimorphism when the male is bright and the female dull in colour the Theory of Sexual Selection affords an explanation. The parallel between the

male birds with ornamental plumage and the brilliantly coloured males of some Lycenids and other Lepidoptera is a close one. Even here we meet with difficulties.

In some cases in which both sexes are alike and perhaps dull coloured, elaborate courtship has been observed, but the appeal may be to some sense other than that of sight. For we know very little of the senses of insects. Only last year the elaborate scent organs of the males of some of the Trichoptera were discovered and described by Moseby in the "Transactions of the Entomological Society."

We know that many Lepidoptera, in which the sexes are very similar, as well as those where sexual dimorphism is marked, possess scent scales or scent organs, but we know very little about them. Even in cases where we suppose that the bright male is coloured to attract the opposite sex, as in *Agriades coridon*, we find that courtship as a rule is practically non-existent. Field observations show that pairing takes place before the wings of the female are dry, and that often the most worn and battered male is successful.

Yet in a species like this we should expect to find an elaborate courtship. Some naturalists have stated that butterfly vision is very poor and that they have no perception of colour. This would be a fatal objection to this theory as applied to dimorphism of colour and pattern. Fortunately, the latest experiments by Dr. Eltringham, suggest that at short distances butterflies see quite clearly and that they do possess colour vision.

When we come to butterflies and diurnal moths which possess a bright and conspicuous colour-scheme alike in both sexes it becomes more difficult to believe that it has arisen in consequence of the influence of sexual selection.

To accept this we must believe that it developed at first in the male and was then transmitted to the female. It may be so, but it seems improbable.

We must seek an explanation of their colouring by examining the habits of those enemies which capture them when the colours are displayed. These enemies are birds.

The most recent and reliable observations on the feeding habits of birds show that, although they seldom pursue butterflies in the open, they catch large numbers as they fly in and out of bushes and other shelter, often when they are feeding or ovipositing. They capture their prey by a quick snap, but seldom make further efforts if they fail at the first attempt.

If we examine the pattern of unprotected (*i.e.* edible) butterflies and moths, we find numerous devices to protect them from this kind of attack. In many *Lycaenidae* which are fond of flitting about bushes and settling on leaves, we find a combined tail and eyespot near the anal angle of the wing, and this is made more conspicuous by the insects' habit of slightly rotating each hindwing in turn. This with good reason is supposed to attract the attention of a bird and lead to it striking at a part of the wing which projects beyond the abdomen rather than at the real head and thorax. The number of specimens

symmetrically shorn of the anal angle supports this view. This is only useful to these butterflies while they are settled.

But the device gives us an indication of the true value of tails which are so common in *Papilio*, in butterflies of other groups, such as *Charaxes*, and in many day-flying moths and even in pale species which fly at early dusk. Ocelli near the apex of the forewing or near the anal angle are probably of use in the same way. These are a common adornment of very different families. They are specially common in the *Satyridae*, and occur in *Vanessa io*, in *Saturnia* and *Nyctipao*. The white spot near the posterior angle of the wing in *Orygia antiqua* and others serves the same purpose. The coloured tip to the forewings in many Pierines such as *Euchloë*, *Teracolus* and *Hebomoia* is another example.

One of the commonest markings found in the most distantly related groups of diurnal moths and butterflies is a conspicuous band or row of spots, often white or cream-coloured, running obliquely across the forewing near the apex. It is especially common in Nymphaline butterflies. *Lethe confusa* is a good example from many amongst the *Satyrids*. At least one species of *Abisara* is marked in this way, and several of *Brassolis*. Even the distasteful *Danaines* and *Euploeines* sometimes show it, and this suggests that it is of great antiquity. The whole outer margin of the wing may be coloured as a strong contrast to the rest, as in *Euranessa antiope*, or only a part of the outer border, usually that of the hindwing. This pattern too is met with in many distant groups.

But, even if we grant that the apex of the forewings or the anal angle of the hindwings, or the outer margins of the wings, which are furthest from the vital parts of the insects, are frequently ornamented in a particularly striking way and are so ornamented to attract attack upon a non-vital part, we are left with a very large number of highly decorated species to which this cannot apply.

One such type of decoration is the chequered pattern found in *Argynnis*, *Pyrameis cardui*, *Pararge megaera*, and many others, another is the transverse striping of black and white or black and chestnut, which occurs in most of the *Neptis* group, *Symbrenthis*, *Abrota*, and *Libythea* in the Old World and in *Melinaea*, *Eucides*, *Mechanitis* and *Metamorphia* in the New. Some of these are distasteful, but I think the pattern itself did not originate as a warning one.

The vertical tiger-like striping of some *Papilios* such as *Iphiclide*s, and the single oblique stripe running across both pairs of wings and converging towards the tip of the abdomen and common to many groups, form further instances. It is white on a black ground in *Limenitis* and in *Cynestis strigata*, but in other groups many pale colours are met with. Looking over the *Rhopalocera* of the World one cannot help being struck by the repetition of certain patterns in diurnal genera far removed from one another in structure, habitat, and in geographical range.

Can these serve the same purpose as the directing marks of the others? The war has taught us the value of camouflage applied to moving objects such as ships. Is it possible that these distinctive

patterns and colour-schemes act as a protection to Lepidoptera in a somewhat similar way?

The butterfly or moth is denied much of the advantage of camouflage by the fact that it must be symmetrical on both sides, but I am by no means sure that it does not gain some protection in this sort of way. Perhaps a better word than camouflage is the term "dazzle colouration."

Imagine that a butterfly feeding unnoticed, or one at rest assimilating with its surroundings and unseen by its enemy, a bird, is disturbed. It takes to flight and suddenly shows a variegated and brilliant upperside. Can this confuse a bird for a second or two? If it can it may save the insect's life, for it is the first moments when close to the bird that are the most dangerous. Once out of reach the bird is unlikely to pursue it seriously. I am not at all sure that a uniformly and soberly coloured insect would not be much easier for a bird to catch under such circumstances than one conspicuous in colour and pattern.

Again, a butterfly or day-flying moth flitting round a bush to feed might catch the eye of a bird more easily with its brilliant display of colour and markings than a dull coloured one, but it might more easily deceive its enemy into making an ineffective stroke. One unsuccessful stroke might save it, because pursuit with repeated attacks is seldom undertaken by a bird. In the case of insects of different habitat and different modes of life generalisation can be carried to a dangerous extent. No doubt many of our difficulties are due to imperfect knowledge of the habits of Lepidoptera and of their enemies. But yet when one meets with these colour schemes and patterns recurring in different groups throughout the world it should be possible to generalise correctly on their true meaning.

One difficulty which will always remain is the impossibility of seeing butterflies through a bird's eyes. Other difficulties can be removed by careful observation and careful notes of successful and unsuccessful attacks on different species. If possible the butterfly, which escapes, should be captured and any injury accurately described. In this way a mass of facts can be accumulated and analysed, and this may go far towards laying a sure foundation on which we may build up a sound theory explaining the meaning of these recurrent colour schemes, and making them as interesting to the mind as they are attractive to the eye of the Naturalist.

REPORT ON THE BIRDS OF EPPING FOREST FOR THE YEAR 1919.

In presenting the Fourth Annual Report the Committee of the Ornithological Section would specially draw attention to a fact mentioned in the First Report, *viz.* :—that certain areas of the Forest are still practically unrecorded. Records are wanted for the Forest between Wanstead Flats and Chingford and from Theydon Bois to the Lower Forest. It will be observed that the Report is now presented in an entirely new form. This has been decided upon as the result of experience gained in previous years and it is believed the new method will prove to be of greater utility for reference purposes.

Two additions and one alteration to the topographical nomenclature of Mr. E. N. Buxton's Guide are proposed, *viz.* :—the part of the Forest therein named Fairmead Bottom to be called FAIRMEAD, and to use the name FAIRMEAD Bottom to indicate the strip of ground between the Old and New Epping Roads, from their junction on the south at Warren House to Hill Wood on the north. At High Beach, immediately to the south of Turpin's Cave Inn lies a very characteristic little valley or hollow which it is proposed to name TURPIN'S HOLLOW.

The nomenclature adopted by the Committee in the following Report and elsewhere is that of the B.O.U. List of British Birds, 1915.

The value of the Report depends largely upon the number and variety of records received, and members and friends are invited to send these to the Secretary of the Committee, Mr. S. Austin, 43, Darenth Road, Stamford Hill, N. 16.

CARRION CROW (*Corvus corone*).—Records for the year show this species to be still increasing. Nest observed on Warren Hill.

HOODED CROW (*Corvus cornix*).—One seen on Fairmead Bottom, November 2nd.

JACKDAW (*Corvus monedula*).—Frequented Chingford Plain during winter. Nested in the tower of High Beach church as in former years—observed there June 28th.

ROOK (*Corvus frugilegus*).—This species visited the Forest in large numbers during July when they were to be seen on the tree-tops—so observed on July 6th and 19th. Mr. F. F. McKenzie, Forest Superintendent, reports as follows on the Wanstead Park Rookery for 1919 :—“There were a great number of nests and they seemed to build more than ever in among the herons. We killed over 170 rooks, but still there were large numbers all the season and winter, but, strange to say, although there seemed to be more rooks than ever this spring [1920] there were not more than 50 nests in the Park.”

BRITISH JAY (*Garrulus glandarius rufitergum*).—Numerous records

during the year. As many as 20 identified on one ramble, October 19th.

STARLING (*Sturnus vulgaris*).—Observed in flocks during winter on Chingford and Warren Plains.

GREENFINCH (*Chloris chloris*).—A number of records. Observed eating hips and haws, Warren, January 19th; feeding on hornbeam seeds, near Ludgate Plain, February 9th, and near Cuckoo Pits, March 2nd; large flock, with chaffinches and tits, near latter place on same date.

HAWFINCH (*Coccothraustes coccothraustes*).—Seen feeding on hornbeam seeds, Cuckoo Pits, March 2nd: and in company with greenfinches and chaffinches (on the ground) in Chingford Wood, April 5th. Also observed on a number of other dates.

BRITISH GOLDFINCH (*Carduelis carduelis britannica*).—Warren Plain, February 2nd; Warren Hill, February 16th; Highams Park, about 12 on alder, February 21st.

SISKIN (*Spinus spinus*).—Several at Highams Park, February 15th; small party, with redpolls, at Highams Park, on alders, December 7th.

HOUSE SPARROW (*Passer domesticus*).—Recorded freely.

TREE SPARROW (*Passer montanus*).—Observed on Chingford Plain, July 20th, and on Whitehall Plain, October 5th.

CHAFFINCH (*Fringilla coelebs*).—Numerously recorded. Song first heard, Woodford Green, January 8th, and at Highams Park, February 26th; seen in courting flight, Cuckoo Pits, March 2nd.

BRAMBLING (*Fringilla montifringilla*).—Several seen feeding with other finches on Debden Slade, April 3rd, 8th.

LINNET (*Acanthis cannabina*).—Heard singing (weakly) on Yardley Hill, May 11th.

LESSER REDPOLL (*Acanthis linaria cabaret*).—Three on birches, back of "King's Oak," January 19th; small flock on alders, Highams Park, throughout February; seven seen on birches, High Beach, February 23rd; eight on alders, Highams Park, March 2nd; flock at Highams Park, April 11th; observed between Loughton and "Wake Arms," July 19th; small flock, Highams Park, December 7th.

BRITISH BULLFINCH (*Pyrrhula pyrrhula pileata*).—Two seen near "Wake Arms" and one by Red Path, January 5th; five in birch spinney, Strawberry Hill, January 12th; one by Connaught Water, January 19th; Hill Wood, February 21st; Chingford Wood, female, April 5th; Gilwell Lane, October 15th; near Whitehall Plain, October 25th; one near Red Path and six near Warren, November 16th; one in Highams Park and one on Long Hills, both on December 7th; Highams Park, December 25th; and pair by Red Path, December 28th.

YELLOW HAMMER (*Emberiza citrinella*).—Several on Yardley Hill, the males in fine plumage, a few scraps of song heard, March 30th; Whitehall Plain, May 18th; near Fairmead, May 22nd; "Wake Arms," June 14th; (on the three preceding dates the birds were in full song); Strawberry Hill, September 8th; Yardley Hill, October 15th.

REED BUNTING (*Emberiza schoeniclus*).—Heard near Connaught Water, June 7th; seen at same place, June 14th; male seen at Fairmead, June 15th.

SKYLARK (*Alauda arvensis*).—Numerous records from Chingford and Whitehall Plains, and Loughton. Heard singing for first time on February 26th, golf links, Highams Park.

PIED WAGTAIL (*Motacilla lugubris*).—Seen on frozen lake, Highams Park, February 19th; a large number (probably hundreds) were seen coming in to roost among the reeds at Staples Hill, Loughton, November 15th, at 3.50 p.m.

TREE PIPIT (*Anthus trivialis*).—The abundance of this species was one of the features of the year. First observed, April 12th, Fairmead Bottom.

MEADOW PIPIT (*Anthus pratensis*).—One observed near Strawberry Hill, September 8th; two at Fairmead Bottom on October 17th, and one on October 19th; High Beach, October 19th.

BRITISH TREE CREEPER (*Certhia familiaris britannica*).—Observed throughout the year. In Chingford Wood, on August 4th, blue tits were observed hustling a tree creeper off a hornbeam, but the creeper returned and, in turn, drove off the tits.

NUTHATCH (*Sitta caesia*).—Recorded throughout the year from Hill Wood and High Beach.

GOLDCREST (*Regulus regulus*).—Seen in Highams Park March 16th and 20th; in Chingford Wood, April 5th, 6th, and November 1st; Connaught Water, December 25th. Seen on Staples Hill, near Debden Slade, and also near Earls Path, during the last week of November and throughout December—"the first seen for three years."—(P.D.H.).

BRITISH GREAT TITMOUSE (*Parus major newtoni*).—Generally recorded throughout the year. Spring note heard February 16th. Observed feeding on hornbeam seeds, October 4th.

BRITISH COAL TITMOUSE (*Parus ater britannicus*).—Well recorded during the year.

BRITISH MARSH TITMOUSE (*Parus palustris dresseri*).—Observed throughout the year.

BRITISH BLUE TITMOUSE (*Parus coeruleus obscurus*).—Constantly observed throughout the year. Nest seen in crab tree near Bury Road, May 31st, young being fed.

BRITISH LONG-TAILED TITMOUSE (*Egithalus caudatus roseus*).—"Although this bird has been mentioned in the daily papers as being very scarce and in places to have disappeared, in the forest district its numbers appear much as usual"—(P.D.H.). Nest being built in Chingford Wood, March 23rd; nest completed near Connaught Water, April 9th, but the snowstorm on the 27th proved fatal, as one of the birds was found dead on the nest a few days later.

GREAT GREY SHRIKE (*Lanius excubitor*).—On December 25th, at Warren Plain, a bird of this species was seen perched, in characteristic shrike fashion, on the topmost twig of a tree. After being watched with the binoculars, the bird was disturbed and flew towards the observer, when the length of the tail was very noticeable. After settling again for a moment on the highest point of another tree, the Shrike then disappeared into the private grounds of "The Warren."—(W.E.G.).

RED-BACKED SHRIKE (*Lanius collurio*).—Seen at Fairmead Bottom, May 12th; pair at Warren Hill, May 17th; pair at Whitehall Plain, May 18th; male with one young bird on Almshouse Plain, July 6th; pair at Warren Hill, July 12th; one at Fairmead, August 24th.

WHITETHROAT (*Sylvia communis*).—First observed in Chingford Wood, May 3rd; last recorded, August 31st.

LESSER WHITETHROAT (*Sylvia curruca*).—First noted, on April 25th, at Strawberry Hill Pond.

GARDEN WARBLER (*Sylvia simplex*).—Song first heard on May 10th, Bury Wood.

BLACKCAP (*Sylvia atricapilla*).—First heard on May 7th, at Loughton; last seen, September 8th.

WILLOW WARBLER (*Phylloscopus trochilus*).—First observed, April 17th, at Black Bushes; nest found, Whitehall Plain, May 18th; young being fed, Cuckoo Pits, August 24th; last recorded, August 30th, Chingford Wood.

WOOD WARBLER (*Phylloscopus sibilatrix*).—Recorded at Bury Road, High Beach, Highams Park, Chingford, Jack's Hill, Loughton, Staples Hill, Wake Arms and Woodford Green. First heard, May 7th, at Loughton; nest being built, May 12th, Woodford; nest found with six young, May 31st, Loughton; young just out of nest, June 15th, Turpin's Hollow, High Beach.

CHIFFCHAFF (*Phylloscopus collybita*).—Numerous records. First heard, April 3rd, thickets near Strawberry Hill; first seen, April 6th, Bury Wood.

MISSAL THRUSH (*Turdus viscivorus*).—Loughton, February 16th; three at Highams Park, March 2nd; Bury Wood, April 6th; Whitehall Plain, May 18th; Yardley Hill, October 15th; Whitehall Plain, December 1st; Long Hills, seen feeding on holly berries, December 7th.

BRITISH SONG THRUSH (*Turdus musicus clarkii*).—Commonly observed. Song first heard on February 23rd, at High Beach.

REDWING (*Turdus iliacus*).—Heard at Turpin's Hollow, High Beach, January 1st; Warren Plain, January 12th, 19th; near Connaught Water, January 18th and February 8th; flocks near Friday Hill frequently "charming," March 29th; many on Whitehall Plain, October 17th, 19th, 25th; Fairmead Bottom and Warren Plain, very numerous, November 2nd, 16th; heard at Long Hills, December 7th.

FIELDFARE (*Turdus pilaris*).—Highams Park, February 20th, 22nd; Fairmead Bottom, May 6th; Yardley Hill, October 12th; Fairmead, in good numbers, November 16th; Gilwell Lane, December 6th; Highams Park, December 25th.

BLACKBIRD (*Turdus merula*).—Constantly recorded throughout year. Abnormally numerous in Highams Park on October 10th, where there was a good crop of berries. The greatest number identified on one walk was 15, October 15th.

REDSTART (*Phoenicurus phoenicurus*).—Frequently recorded. First seen at Fairmead Bottom, April 25th; young bird seen, Chingford Wood, June 29th; Ludgate Plain, August 23rd; several on Warren

Plain, one at Strawberry Hill, and one at Old Church Plain, August 24th; one at Hatch Plain, August 30th; one at Strawberry Hill, and many at Warren Plain, August 31st.

BRITISH REDBREAST (*Erithacus rubecula melophilus*).—Numerous records. Earliest song, February 26th, Warren Hill; latest song, November 2nd, High Beach and Hill Wood.

COMMON NIGHTINGALE (*Luscinia megarhyncha*).—Records from Chingford Plain, Connaught Water, Fairmead Bottom, Ludgate Plain, Red Path, Theydon Bois and Whitehall Plain. Song first heard at Fairmead Bottom, April 23rd.

WHINGCHAT (*Savicola rubetra*).—One observed on Fairmead Bottom, May 23rd.

HEDGE SPARROW (*Accentor modularis*).—Seemed more numerous than last year. Fairmead, February 8th; between Chingford and Loughton, in song, February 16th; Hawk and Bury Woods, in song, April 6th; Chingford Plain, in song, May 3rd; Connaught Water, in song, May 4th; Ludgate Plain, in song, May 10th, 24th; several heard singing, Connaught Water, July 20th; Chingford Plain, in song, September 21st; several at Yardley Hill, October 15th.

WREN (*Troglodytes troglodytes*).—Records throughout year from Bury Wood, Buttonseed Corner, Chingford, Cuckoo Pits, Fairmead, Hawk Wood, Highams Park, Mount Pleasant and Old Church Plain. Song recorded in April, May, and December.

SPOTTED FLYCATCHER (*Muscicapa grisola*).—First seen between Chingford and Theydon, June 15th; Woodford Green, June 21st; Theydon Bois, July 19th; Highams Park, numerous, August 30th; Strawberry Hill, two, and Fairmead, two, August 31st; Connaught Water, two, and Strawberry Hill, one, September 8th.

SWALLOW (*Hirundo rustica*).—Seen at Fairmead Bottom, April 9th; Warren Plain, May 17th; Highams Park, June 28th; High Beach, July 19th; a fair number about generally, August 24th; Chingford Plain, August 31st; over Chingford and Warren Plains, September 21st.

MARTIN (*Delichon urbica*).—Numbers seemed less this year. Highams Park, May 18th; High Beach, June 15th; Whitehall Plain, June 28th; High Beach, July 19th; Chingford Plain, August 24th, 31st.

SAND MARTIN (*Riparia riparia*).—Woodford Green, May 11th; High Beach, June 15th.

BRITISH GREAT SPOTTED WOODPECKER.—(*Dryobates major anglicus*).—Species seemed more numerous this year. Almshouse Plain, August 10th; near Bury Road, March 23rd, May 10th; Bury Wood, April 6th; Buttonseed Corner, October 15th; Chingford Wood, January 18th, May 3rd, 4th, 11th, 18th, 24th, 25th, 31st, June 1st, 14th, 15th, 28th, July 6th, 19th; Connaught Water, December 7th; near Cuckoo Brook, January 11th, 18th, March 15th, October 26th; Cuckoo Pits, May 4th, July 19th; Highams Park, February 24th, April 25th, 28th, May 18th, August 17th, December 7th; Hill Wood, February 21st, 22nd, August 24th, December 7th; Warren Hill, December 28th; Woodman's Glade, August 23rd, September 27th;

Yardley Hill, December 6th. A portion of a blown-down branch of a beech tree (in which this species had nested), from Chingford Wood, has been placed in the Forest Museum, together with photographs of the tree.

LESSER SPOTTED WOODPECKER (*Dryobates minor*).—High Beach, February 23rd; Strawberry Hill, two, April 24th, one, April 30th.

GREEN WOODPECKER (*Picus viridis*).—Seen and heard frequently throughout year. Records from Chingford Plain, Connaught Water, Debden Slade, Fairmead, High Beach, Highams Park, Hill Wood, Ludgate Plain, Loughton, Old Church Plain, Strawberry Hill, and Whitehall Plain. One bird observed moving backwards down bough, near Ludgate Plain, March 1st; another seen feeding on ground among anthills, but there were no signs that the ants' nests were being attacked, Whitehall Plain, October 25th.

CUCKOO (*Cuculus canorus*).—Commonly reported during May and June. First heard, Fairmead Bottom, April 25th. Female note heard, Whitehall Plain, May 18th.

SWIFT (*Microtus apus*).—Numbers about as usual. First observed, May 5th, Loughton.

NIGHTJAR (*Caprimulgus europaeus*).—First seen, May 15th, Clay Ride (D.P.H.); "Wake Arms," 3 males flushed, no females seen, June 28th; Wake Valley, two young birds found about a week old—male bird flushed at another place, June 28th (R.H.F.).

KINGFISHER (*Alcedo ispida*).—Connaught Water, January 12th; seen upon several occasions during February, at Highams Park Lake; nest found at Woodford Green, May 10th, young flown from nest, May 19th; one seen flying over the bushes on the Verderer's Path at Woodridden Hill, July 6th; Highams Park, seen fishing, July 17th; Wake Valley Pond, September 5th.

TAWNY OWL (*Strix aluco*).—Heard hooting at "Warren House," 6 p.m., January 1st; frequented Chingford and Bury Woods—observed there April 6th and May 10th; Loughton, February 22nd; Woodford Green, February 24th.

SPARROW HAWK (*Accipiter nisus*).—One flushed on Fairmead Bottom, November 16th, flew off with prey (which had the appearance of a blackbird) in its talons.

KESTREL (*Falco tinnunculus*).—Almshouse Plain, February 2nd, 23rd; Ludgate Plain, March 30th; Red Path, July 20th; old bird hovering and two young birds flying round, Highams Park, September 28th; Fairmead Bottom, October 10th; Hawk Wood, October 15th; Hill Wood, High Beach, November 15th; Whitehall Plain, December 7th.

MALLARD (*Anas boschas*).—Flying over Chingford Wood, January 11th; on pond at Fairmead, February 23rd; four or five rose from flooded brook near Ludgate Plain, April 5th; two at Cuckoo Pits, April 5th; two flying over Chingford Wood, April 6th; female on Connaught Water, May 6th; two flying over Warren Pond, May 18th; three flying, Highams Park, June 28th; Connaught Water, one, August 31st, two, September 21st, one, October 17th; Highams Park, several, October 10th; 32 on Connaught Water, December 28th.

POCHARD (*Nyroca ferina*).—Three females on Highams Park lake, February 27th, 28th.

TUFTED DUCK (*Nyroca fuligula*).—Highams Park lake:—one female, March 2nd; one male and four females (in full plumage) March 9th; four males and four females, March 17th; seven males and three females, April 11th.

COMMON HERON (*Ardea cinerea*).—One seen, flying very low, over Cuckoo Pits, July 27th. Mr. McKenzie reports as follows on the Wanstead Park Heronry for 1919:—"I find that in March the keeper counted 47 nests, then we had nothing but floods and most of the island was under water all April; he counted them again early in May, when they numbered 54."

WOODCOCK (*Scolopax rusticola*).—One flushed at the back of the "Robin Hood" during the latter part of October (P.D.H.). Keeper Bynoth has on several occasions during the autumn put one or two up in the Birch Wood near Strawberry Hill pond; also in the marshy ground at the back of the "Robin Hood" (P.D.H.).

LAPWING (*Vanellus vanellus*).—Flock of about 40 flying over Fairmead, November 16th.

BLACK-HEADED GULL (*Larus ridibundus*).—Four flying over Strawberry Hill, November 16th.

LITTLE GREBE (*Podiceps fluviatilis*).—One on Strawberry Hill pond, April 2nd, and remained there for ten or twelve days (P.D.H.). Highams Park lake, three, October 10th.

MOORHEN (*Gallinula chloropus*).—Common on Highams Park lake, as many as 35 being seen on one occasion, February 27th; Cuckoo Pits, March 2nd, July 27th, August 3rd and 4th; heard at Loughton, May 3rd, one on each Strawberry Hill pond, October 17th; Connaught Water, December 6th, 7th.

COOT (*Fulica atra*).—Highams Park lake, one, March 17th, two on June 28th.

STOCK DOVE (*Columba aenas*).—Strawberry Hill, September 9th.

WOOD PIGEON (*Columba palumbus*).—Chingford Wood, January 18th; Hill Wood, February 21st; Blackbush Plain, May 31st; Hawk Wood, October 15th; Fairmead, two, November 16th.

PHEASANT (*Phasianus colchicus*).—Male seen at Loughton, May 7th; male, near Wormleyton Pits, July 12th; male and female, near "Wake Arms," July 27th.

PARTRIDGE (*Perdix perdix*).—Yardley Hill, two, October 15th.

OBITUARY NOTICES.

LORD WALSINGHAM.

Thomas de Grey, 6th Baron Walsingham, was born in Mayfair, July 29th, 1848, and educated at a private school near Tunbridge Wells for four years and afterwards at Eton and Cambridge. He resisted the family tendency towards Law and chose Politics, being elected M.P. for West Norfolk in 1865, retaining his seat until he succeeded to the title on the death of his father in 1870.

In 1876 he was appointed a trustee of the British Museum, to his entomological library and collections were transferred in 1911. He held several other public offices and was a member of the Entomological Society of London, Zoological Society, British Ornithological Union, Linnean Society, Royal Society and other important Societies at home and abroad.

A love for Zoology in general and Entomology in particular characterised him from early youth, and innumerable monographs, papers, and notes testify to his knowledge of, and devotion to, the subject. His earliest note was written at the age of 8 in a letter from his stepmother to his father, and his first and last public contributions appeared in the "Entomologist's Monthly Magazine," in 1867 (vol. iv.) and 1920 (vol. lvi.) respectively. He began by collecting and studying the Macro-lepidoptera, but afterwards specialised on the "Micros," on which he became a leading authority, and his own collection of at least 50,000 specimens, to which he added those of Zeller, Hofmann, and other continental lepidopterists, was representative of European, American, and North African species, and is now in the Natural History Museum at South Kensington, as is also his almost complete collection of preserved larvæ of the British Macro-lepidoptera.

Lord Walsingham was elected High Steward of the University of Cambridge in 1891, and it was during the performance of duties in connection with that office in November last that he fell ill. Pleurisy supervened, and he died of heart-failure on December 3rd, and was buried in the churchyard at Merton Park, Norfolk. He was married three times, but, as he left no heir, the title descends to his half-brother, the Hon. John de Grey, the well-known London police magistrate.

W. R. DODD.

On December 4th, 1917, W. Ralph Dodd died at his home, Burton Grange, Cheshunt, Herts, in his sixty-second year. In 1870 Mr. Dodd entered the drug trade, serving an apprenticeship of 5 years at Market Drayton, afterwards going to Bristol and later on to London, where he joined the staff of Allen & Hanburys, Ltd., subsequently becoming a director in that business. Mr. Dodd was a man of forcible

character, who combined in an uncommon degree all the advantages of wide and varied technical knowledge and experience of the practice of pharmacy with business acumen and address. His varied experience in the drug trade gave him a keen general interest in many branches of Natural History. He was a member of several Natural History Societies, though as a naturalist he specialised in no single one. His chief outdoor interests in later years were fishing, his garden and his farm. Mr. Dodd's was a gracious personality, and he commanded the esteem and affectionate regard of all who came in contact with him.

Mrs. H. A. ALLPASS.

Mrs. Allpass was the widow of the late Rev. H. A. Allpass, who was for 17 years Principal of the Monoux School at Walthamstow, and was at one time Chaplain of the British Legation at Monte Video. Before her marriage she was herself Principal of a large girls' school—one of those in the gift of the Drapers' Company. She was a lady with wide literary and scientific interests, highly intellectual and very well educated, having taken honours at Newnham. In addition to her educational activity she took great interest in all social welfare movements and her loss was felt by a large circle of friends.

The Society has also lost by death LT. W. C. A. AUSTEN of the Middlesex Regiment, killed in action in France in 1916, and MR. C. FLOWERS, who died in August, 1919.

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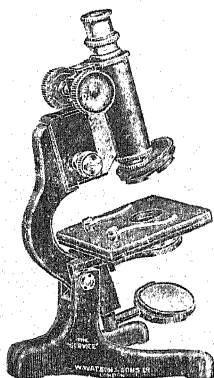
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 *Nicholson, Mrs. E.A., 42, Avenue Road, Highgate, N. 6. (Bot.)
 Payne, H. T., 70, Castlewood Road, Stamford Hill, N. 16. (Lep.)
 Peacock, F. G., "Brierlea," Stormont Road, Highgate, N. 6. (Mam.)
 Pearce, F. C., "Higham Court," Woodford Green. (Orn.)
 Pearce, J. P., "Higham Court," Woodford Green. (Orn.)
 Pickett, C. P., F.E.S., 28, Colworth Road, Leytonstone, E. 11. (Lep.)
 Prout, L. B., F.E.S., 84, Albert Road, Dalston, E. 8. (Lep., Biol.)
 Raven, Rev. C. E., 4, Park Terrace, Cambridge. (Lep. and Orn.)
 Riches, J., 52, Calverley Grove, Hornsey Rise, N. 19. (Lep., Bot.)
 Robbins, R. W., "The Rosery," Limpsfield, Surrey. (Bot., Lep., Orn., Arch.)
 Robbins, Mrs., "The Rosery," Limpsfield, Surrey. (Bot., Arch., Orn.)
 Roberts, J. G., Segary Villas, Hadley Road, New Barnet. (Lep.)
 *Ross, J., 18, Queens Grove Road, Chingford, E. 4. (Bot., Plant Galls, Orn.)
 Routledge, G. B., F.E.S., Tarn Lodge, Headsnook, Carlisle. (Lep. Col. Hem.)
 Sabine, L. A. E., 10, Franconia Road, Clapham Common, S.W. 4. (Lep.)
 Samuelson, Edward, Fairview, 39, The Ridgeway, Chingford, E. 4. (Mam., Rep.)
 Sarvis, John, May Cot, Maybury Hill, Woking. (Lep., Bot., Hym.)
 Shaw, V. Eric, "Betula," Park View Road, New Eltham. (Hym. Lep. Micr., Api.)
 Sich, Alfred, F.E.S., Corney House, Chiswick, W. 4. (Lep., Conch.)
 Simes, J. A., F.E.S., "Greenacres," Woodside Road, Woodford Green. (Lep., Orn.)
 Simpson, W., M.B., B.S., "Polmennor," Snakes Lane, Woodford Green. (Arch. Bot., Lep., Plant Galls.)
 Smith, A. C., "Horton," Mornington Road, Woodford Green. (Ent.)
 Smith, C. B., 61, Onslow Gardens, Muswell Hill, N. 10. (Lep.)
 Stemp, R., Hinton Villa, Heathcote Grove, Chingford, E. 4.
 Stevenson, H. E., F.C.S., 22, Wilton Grove, Wimbledon, S.W. 19. (Chem.)
 Stowell, H. S., M.S.A., 70, Victoria Street, S.W. 1. (Arch.)
 Stuart, Vernon, 78, Elgin Crescent, Notting Hill, W. 11. (Lep.)
 Tautz, P. H., F.E.S., Cranleigh, Pinner, Middlesex. (Lep.)
 Tebb, R. N. S., The Old Lodge, Epsom. (Lep.)
 Thomas, Mrs. G. E., 9, Talbot Road, Isleworth, Middlesex. (Orn.)
 Thomas, G. O., "Wilfrid Lawson Hotel," Woodford Green.
 Todd, R. G., F.E.S., "The Limes," Hadley Green, Barnet. (Lep.)
 Tremayne, L. J., 29-30, Charing Cross, S.W. 1. (Bot. Lep. Arch., Plant galls, Orn.)
 Tremayne, Mrs., 29-30, Charing Cross, S.W. 1. (Orn., Arch., Bot.)
 Tooley, Miss M., The Fairstead, Roebuck Lane, Buckhurst Hill. (Api.)
 Tooley, Mrs. E. F., The Fairstead, Roebuck Lane, Buckhurst Hill.
 Towsey, Miss G. M., Parkgate, Petersham.
 Van Lessen, R., B.Sc., 69, Downs Road, Clapton, E. 5. (Chem.)
 Warren, S., Hazzledine, F.G.S., F.Z.S., "Sherwood," Loughton. (Prehistoric Anthropology, Geol.)
 Watkins, Miss H., 12, Connaught Avenue, East Sheen, Mortlake, S.W. 14.
 Watson, W., "Rosedale," Southlands Road, Bickley, Kent. (Bot.)
 Watt, J. Mc B., Monkham's Farm, Woodford Green. (Orn., Mam.)
 Wattson, R. Marshman, 32, St. Andrew's Road, Stoke Newington, N. 16. (Arch.)
 Wilde, Mrs. C. L., "Lindfield," Marshall Road, Godalming. (Arch. Bot., Galls.)
 Williams, C. H., 5, Lower Belgrave Street, Eaton Square, S.W. 1. (Lep.)
 Williams, H. B., LL.B., F.E.S., 112a, Bensham Manor Road, Thornton Heath, Surrey. (Lep.)
 Willsdon, A. J., 46, Dover Road, South Wanstead, Essex. (Lep.)
 Wood, H. Worsley, 31, Agate Road, Hammersmith, W. 6. (Lep.)

BRANCH ASSOCIATES.

- Aldworth, A. G., Ridgeway House, The Ridgeway, Chingford, E. 4.
 Aldworth, Mrs. A. G., Ridgeway House, The Ridgeway, Chingford, E. 4.
 Allpass, E. G. H., "Heydor," Endlebury Road, Chingford, E. 4.
 Bartlett, H. H., 81, Station Road, Chingford, E. 4.
 Chandler, J. H., J.P., 22, Scholars Road, Chingford, E. 4.
 Bacot, Miss A. H., York Cottage, 14, York Hill, Loughton, Essex.
 Connoll, Miss E., 11, Eglington Road, Chingford, E. 4.
 Crafford, Miss N. F., 11, Eglington Road, Chingford, E. 4.
 Crisp, Miss D. G., 33, Mornington Road, Chingford, E. 4.
 Cross, R. L., 6, Warren Road, Chingford, E. 4. (Orn.)
 Cross, Mrs. P. E., 6, Warren Road, Chingford, E. 4.
 Davis, Mrs. F. H., 41, Mornington Road, Chingford, E. 4.
 Fulcher, Miss, "St. Helens," Woodland Road, Chingford, E. 4.
 Gain, Mrs. E. R., 49, Buxton Road, Chingford, E. 4.
 Halloway, Miss M., 19, Buxton Road, Chingford, E. 4.
 Halls, Mrs. E. W., The Bank House, Chingford, E. 4.
 Halls, J. H., The Bank House, Chingford, E. 4.
 Hart, Miss H., The Green Farm, E. 4.
 Hibbert-Ware, Miss A., F.L.S., The White Cottage, Gilwell Lane, near Chingford.
 Hornblower, A. B., 32, Forest Drive East, Leytonstone, E. 11.
 Hubbard, Mrs., 110, Station Road, Chingford, E. 4.
 Jones, Miss, 3, Connaught Avenue, Chingford, E. 4.
 Huck, H., M.P.S., 35, Warren Road, Chingford, E. 4.
 Kilby, G. S., 54, Lombard Street, E.C. 3.
 Lees, C. H., D.Sc., F.R.S., East London College, Mile End Road, E. 1.
 (Meteorology.)
 Lewis, T. G., 61, Empress Avenue, Woodford Green.
 Lloyd, Miss F. M., 41, Mornington Road, Chingford, E. 4.
 Loram, H. Y., 49, Buxton Road, Chingford, E. 4. (Geol.)
 Mancell, Mrs. A. W., 4, Connaught Avenue, Chingford, E. 4.
 Mancell, Miss M., 4, Connaught Avenue, Chingford, E. 4.
 Mathieson, Miss M. L., 7, Crescent Road, Chingford, E. 4. (Meteorology.)
 Merritt, B., "Holme Lacey," Warren Road, Chingford, E. 4.
 Proctor, Mrs. E. M., 2, Woodland Road, Chingford, E. 4.
 Puck, Alec, 12, The Ridgeway, Chingford, E. 4.
 Samuelson, Miss Dorothy, Fairview, 39, The Ridgeway, Chingford, E. 4.
 Sayer, Mrs. E. G., 33, Mornington Road, Chingford, E. 4.
 Sheppard, J. H., "Simla Cottage," Snakes Lane, Woodford Green.
 Simes, Miss H., 51, Kenninghall Road, Clapton, E. 5.
 Stevenson, Mrs. H. E., 22, Wilton Grove, Wimbledon, S.W. 19.
 Stratton, Miss Isabel, 37, Buxton Road, Chingford, E. 4.
 Thomas, G. W., 86, James Lane, Leyton, E. 10. (Orn., Bot.)
 Young, J., 87, Station Road, Chingford, E. 4.

COUNTRY ASSOCIATES.

- Allen, William, "Southview," Spa Road, Radipole, Weymouth. (Bot.)
 Allnutt, C. E., "Kyle More," Railway Approach, Worthing. (Arch.)
 Bickham, Spencer H., Underdown, Ledbury. (Bot.)
 Blackburne, F. W., "Chatsworth," Carlisle Parade, Hastings. (Micr.)
 Blake, Wm., Acacia Villa, Ross, Herefordshire. (Orn. & Conch.)
 Bostock, E. D., Oulton Cross, Stone, Staffordshire. (Lep.)
 Buckley, G. G., M.D., F.S.A., Rye Croft South, Manchester Road, Bury. (Lep., Dip.)
 Butler, W. E., F.E.S., Hayling House, Oxford Road, Reading. (Lep.)
 Cassall, Dr. R. T., F.E.S., The Surgery, Abertillery, Mon. (Lep.)
 Cooke, Rev. P. H., M.A., Ickleton Vicarage, Great Chesterford, Essex. (Bot.)
 Culpin, M., M.B., F.R.C.S., Slyder's Gate, Loughton, Essex. (Biol.)
 Elford, Rodney R., Glencoe House, 139, Rosary Road, Norwich. (Fnt.)

- Fison, Eliot Robert, "Sorrento," Brighton Road, Purley.
 Grubb, Walter C., Barberton, Transvaal. (Geol.)
 Hancock, G. D., Westcroft, Exmouth, S. Devon.
 Hopkins, Prof. F. G., M.A., M.D., F.R.C.P., F.R.S., 71, Grange Road, Cambridge.
 (Biochemistry.)
 Longley, W., "Avesbrook," Brook Road, South Benfleet, Essex. (Lep.)
 Miller, Miss E., "The Croft," Rainsford Lane, Chelmsford. (Lep.)
 Moore, J. W., Middleton Dean, Middleton Hall Road, King's Norton, Birmingham.
 (Lep.)
 Pike, Oliver G., Ridgemount, Winchmore Hill, N. 21.
 Porritt, G. T., Elm Lea, Dalton, Huddersfield. (Lep., Neur., Orth.)
 Portway, J. B., jun., 91, The Avenue, West Ealing, W. 13.
 Studd, F. F., M.A., B.C.L., F.F.S., Exeleigh, Starcross, Devon. (Lep.)
 Ward, J. Davis, "Limehurst," Grange-over-Sands, Lancs. (Lep.)
 Wood, P. Worsley, M.A., Emmanuel College, Cambridge. (Field Botany).

NOTE.—The following abbreviations are used in the above lists:—Api., Apiculture; Arch., Archaeology; Ast., Astronomy; Biol., Biology; Bot., Botany; Chem., Chemistry; Col., Coleoptera; Conch., Conchology; Dipt., Diptera; Ent., Entomology; Ethn., Ethnology; Geol., Geology; Hem., Hemiptera; Hym., Hymenoptera; Ichth., Ichthyology; Lep., Lepidoptera; Mam., Mammalia; Micr., Microscopy; Neur., Neuroptera; Orn., Ornithology; Orth., Orthoptera; Ool., Oology; Rep., Reptilia; Zoo., Zoology. * Signifies a Life Member.

EXTRACTS FROM MINUTES

(Ornithological communications included in the Epping Forest Diary (see pp. 36 to 42) are omitted here.

January 6th.—Mr. P. W. Horn exhibited a skin of Green Sandpiper from Leadenhall Market, and one of Dunlin showing traces of breeding plumage colouration; also a large Heron pellet consisting of matted fur of rats, elytra of water beetles and what was apparently a portion of a chameleon-fly (*Stratiomys*); pellets of Little Owl containing elytra of beetles, but no feathers; mounted specimens of Macedonian birds, viz.:—Crested Lark, Bee-eater, Hoopoe and Rose-coloured Pastor.

Mr. Austin said that a pair of Lesser Redpolls had been seen and heard in Finsbury Park, 8th June, 1919, and that on 20th July a pair (possibly the same) were seen, which from their behaviour appeared to have nested in the Park.

Mr. Glegg reported many Golden Plover at Abridge, Sparrow Hawk at Passingford Bridge, and Coots at Navestock Lake, 26th December, 1919.

Mr. Bacot said he had seen 30 to 50 Swifts hawking about at New Holland, Lincs., last October.

Mr. Simes reported 1 Swift seen with Martins on 4th September last; also that Kestrels seemed to be on the increase and tame enough to come into his garden at Woodford Wells, and that Oak-apples were abundant last May and were being opened by Jays and Wood Pigeons. He also reported Partridges as eating *Pararge megera* and Pheasants as eating *P. egerides*.

Mr. A. W. Mera recorded *P. megera* near Loughton last summer.

PAPER.—Mr. Glegg read the first of two papers on "Macedonian Birds" giving an account of the various birds that had come under his notice, whilst he was with the army in that country.

February 20th.—EXHIBITS.—Mr. Riches, *Abraxas grossulariata*, reared in 1919 from North London larvæ and showing a tendency to increased black areas.

Mr. H. B. Williams his series of *Agriades coridon* consisting of 488 specimens in 8 cabinet drawers, and containing:—

1. A series of pathological and teratological forms.
2. A series of male upperside aberrations, showing the combination of colour and marginal marking, and including *abs. marginata*, Tutt., and *subsuffusa*, Tutt.

3. Dwarf forms.

4. A series of female upperside aberrations, showing the combination of the development of:—

(a) red marginal lunules,

(b) blue ground colour,

the series forming a complete gradation from ab. *subocellata*, Tutt., to ab. *pertithonus*, Tutt., and including the following interesting forms: Ab. *aurantia*, Tutt., ab. *radioalbulimulata*, Tutt., ab. *semisyngrapha*, Tutt., ab. *tithonus*, Meig.; and also 7 specimens from Royston of a form more scaled with blue than ab. *semisyngrapha*, Tutt., but less so than ab. *tithonus*, Meig.

5. Abs. *inaequalis*, Tutt., and *roystonensis*, Pickett, and forms combining the latter with ab. *semisyngrapha*, Tutt., and a few specimens asymmetrically scaled with blue.

6. Ab. *flavescens*, Tutt (with pale marginal lunules) and a ♀ of a light khaki colour.

7. A series of underside aberrations, including the following striking forms:—

A pale sepia-coloured ♀ with no trace of orange markings (Royston, 1915).

ab. *extensa*, Tutt., ab. *addenda*, Tutt.

ab. *antico-juncta*, Tutt., ab. *irregularis*, Tutt.

ab. *corydonis*, Bergstr., 5 ♂♂ and a ♀.—Spotting completely obsolete.

ab. *cinnus*, Gerh.—Hindwing spotting obsolete, forewings normal.

ab. *cinnus-obsolata*, Tutt., abs. *antico-extensa-obsolata*, and *antico-obsolata*, Tutt.

ab. *obsolata*, Tutt., ab. *biarcuata*, Tutt.

ab. *costajuncta*, Tutt., and a ♀ with the greenish-blue basal scales covering the whole of the right hindwing, except the costal area.

Most of the specimens exhibited were taken either at Royston or at various localities in the Chiltern Hills in 1914-1919.

Mr. Edelsten, *Dianthoecia luteago* and its form *argillacea* to show the difference between *D. luteago* and *D. Barrettii*.

Mr. Hodge, a collection of preserved larvæ of British Lepidoptera on their natural food plants. These consisted of some of the more difficult larvæ such as green, hairy and tufted species which usually suffer in appearance during the process. In cases where he had found it necessary to replace lost colours he had used powdered crayon and other materials, oil paints being too glossy and water colours non-adhesive to the larval skins. He had copied the colours from living specimens, and in all cases the dried food-plants were preserved as nearly as possible as they appeared when the larvæ were taken.

Mr. Robbins, a very light form of *Xanthorhoë fluctuata* from Forest Row, Sussex, August, 1919.

March 2nd.—Mr. A. E. Holte Macpherson, F.Z.S., read a paper on

"London Birds." This consisted of a series of notes made chiefly from personal observations in his daily morning walk across Kensington Gardens and Hyde Park. Over 100 species were mentioned and reference made to their occurrence in the London area, including records from Battersea Park, Hampstead, Hackney, Stratford and Chiswick. The lecturer said that the only bird nesting in London that seems to be on the increase is the Wood Pigeon. The House Sparrow had decreased during the war. In the discussion which followed the lecture, the President remarked that Rooks had nested in the grounds of Guy's Hospital in 1915, but they disappeared in 1919. Starlings were to be seen there and Tawny Owls had cleared off the sparrows.

Mr. Horn recorded a Missel Thrush chattering in Whitechapel on February 26th.

Mr. Riches exhibited *Eupithecia subfulvata* with 4 var. *arydata*, reared from N. London larvae.

April 18th.—Mr. Horn exhibited a cinnamon-coloured Blackbird obtained by Mr. Austin, who remarked that the bird had frequented Dr. Culpin's garden at Loughton for 18 months.

COMMUNICATION.—The President recorded the Wryneck at Limpsfield, April 9th, and Mr. Hanson the same species at Enfield on April 8th and the Willow Warbler at Bush Hill Park, April 4th, and Enfield, April 8th.

Mr. Ross said he had observed a nest being built by Long-tailed Tits, which was apparently built in 15 days, and as a nest of this species was on record containing 1500 feathers it showed great activity on the part of these birds in collecting these feathers and the other materials, such as lichen, etc.

May 4th.—The President said that botanically the season had been very early. In allotments numbers of spring cabbage had run to seed owing to the warm weather in January. At the beginning of April the season was 3 weeks in advance of the normal, but was not so much in advance now. Mr. Austin said that as far as migrant birds were concerned none had been conspicuously early this year. Mr. Mera said he did not think insects were particularly early compared with vegetation. Mr. Glegg recorded Swifts at Stoke Newington Reservoirs April 30th, Oystercatcher and Dipper at Dumblane April 25th, and for Aberdeenshire and Kincardineshire 46 species identified from April 25th to 28th, including Corn and Reed Buntings, Meadow and Rock Pipits, Wheatear, Willow Warbler, Swallow (arrived 27th), Sandpiper, Heron, Herring and Lesser Blackbacked Gulls, Red-breasted Merganser (a pair), Carrion and Hooded Crows, Rock Dove, Curlew, Eider Duck and Peregrine Falcon; Tufted Duck and Coot near Forfar, April 29th.

PAPER.—Dr. Cockayne read a paper on "Fluorescence in Lepidoptera," in the course of which he said that some authorities thought that certain brilliant insect colours were due to structure and others

thought them due to pigment. The pigmentary colours of insects and other objects depended on the absorption of light of various wave lengths, but others were certainly due to structure apart from pigment. In 1915 the writer of a paper in the "Canadian Entomologist" suggested that bright colours were due to the presence of fluorescent pigment and recently it had been possible to prove these theories. By using a quartz mercury vapour lamp an invisible beam of ultra-violet light was obtained, which showed up fluorescent objects and many not hitherto suspected of being fluorescent, such as human teeth, had been found to be so. It was suggested that Lepidoptera should be tested, and Dr. Cockayne selected a number of iridescent blues and purples, and metallic coppers from different groups. These were not fluorescent, but the yellow and black wings of some species of *Ornithoptera* and a number of moths proved to be so.

June 1st.—LIBRARY.—A vote of thanks was accorded to Mr. H. Kirke Swann, F.Z.S., M.B.O.U., for a gift of 4 parts of a new work by him on the Accipitres.

EXHIBITS.—Mr. H. B. Williams, *Aricia medon* and its varieties *salmacis* and *artaxerxes*, from Castle Eden Dene, Aberdeenshire and Kincardineshire. Mr. Burkill, galls of *Andricus circulans* on *Quercus cerris*, from near Hounslow; galls of an apparently unrecorded mite causing white hairy tops to the heads of *Galium aparine*, from near Longford, and galls of *Neuroterus tricolor* with the flies emerging from them. Mr. Bishop, *Veronica acinifolia* (a Continental species), found near Chiddingfold, Surrey, by Mrs. Wilde, this being its second recorded occurrence in Britain; *Lathraea clandestina*, parasitic on Napoleon's Willow at St. Helena, and also found in the R.H.S. Gardens at Wisley and another locality in Surrey; *Erysimum* (either *variegatum* or *hieracifolium*) found on a wall at Saffron Walden; *Myosurus minimus* and *Oenanthe silaifolia* from Chertsey Meads.

PAPERS.—Mr. Ross read an interesting series of notes on "The Distribution of the Great Spotted Woodpecker in Epping Forest," and in the course of the discussion which followed Mr. Glegg expressed the opinion that this bird is increasing in the Forest, as it is seen and heard frequently and is the most common of the three species of woodpecker.

September 7th.—EXHIBITS.—Mr. Burkill, galls of *Apion scutellare* on *Ulex nanus*; *Perrisia epilobii* and *P. kiefferiana* on *Epilobium angustifolium*; *Aphilotrix globuli* on *Quercus pedunculata*; *Andricus circulans* on *Q. cerris*; *Livia juncorum* on *Juncus* (? *acutiflorus*); *Carpotricha pupillata* on *Hieracium* (? *umbellatum*) and galls of a Dipteron on *Serratula tinctoria*; all from the district between Virginia Water and Sunningdale.

COMMUNICATIONS.—Mr. Robbins recorded large plants 18 inches across of *Anagallis caerulea* in a field near Oxted, *Erythraea pulchella* from W. Surrey, and mentioned a field near Godalming cultivated on the 3 years rotation system; when the crop was corn a lot of *Silene*

anglica appeared amongst it and when clover was sown *Cuscuta trifolii* always appeared but these two plants never appeared together. He thought this pointed to suspended germination of seeds in the soil. Mr. Watson considered that we should lose annual plants if delayed germination did not ensure a supply of seeds being held in reserve for each year.

October 5th.—EXHIBITS.—Mr. Ross (on behalf of Mr. Nicholson) galls of *Massalongia rubra* on *Betula verrucosa* leaves from Hale End. Only some half-dozen leaves on one of a dozen bushes were found to be attacked. Mr. Burkill, leaves of *Viola cornuta* from a Stoke D'Abernon garden rolled by an *Eriophyes* apparently; leaves of *Ulmus campestris* from Bookham Common with white hairs beneath due to *Eriophyes* (Houard 2044); leaves of *Aesculus hippocastanum* from Stoke D'Abernon with masses of red hairs in the angles between the veins, possibly due to *Eriophyes hippocastani* (see Houard 4049), and *Biorrhiza renum* on *Quercus pedunculata* found by Mr. Ross on Bookham Common.

Mr. Hall raised the question of the City pigeons being attacked by Peregrine Falcons, as had been stated in a newspaper recently. Mr. Glegg said that Peregrines had been recently supposed to be nesting on the Houses of Parliament, and Mr. Austin said that a few years ago they had been reported as nesting at Bromley, Kent. He also said that when at Hastings recently he had noticed a continuous flight of Martins and Swallows from West to East Kent, a small portion of the flight, which passed him in ten minutes, being estimated to consist of between 300 and 400 birds; he suggested that they were making for Dungeness Point, some ten or twelve miles distant, whence they would cross to the Continent. Mr. Glegg said that the Little Owl was becoming common, it having been heard calling frequently on September 1st at Theydon Bois, Hobbs Cross, at all hours at Lingfield, and Mrs. Tremayne had noticed the same thing in Berkshire.

PAPER.—Mr. Glegg then read the second portion of his paper on "Macedonian Birds," referring to 155 species, identified as belonging to 84 genera.

November 2nd.—EXHIBITS.—Mr. H. Worsley Wood, a specimen of *Catocala nupta*, measuring only 61 mm. across the wings, the average measurement being 74 mm.

COMMUNICATIONS.—Mr. Glegg read a list of 70 species of birds observed during the latter half of October, at Lymington; these included Grey Wagtail, Grey Plover, Cirl Bunting (common), Hooded Crow, and Great Crested Grebe.

PAPER.—Mr. Bishop read "Botanical Notes from Teesdale," in which he referred to many rare and interesting species found by Mrs. Wilde and himself in that district during visits in the last two years. Amongst the more notable may be mentioned *Thlaspi alpestre*, *Dryas octopetala*, *Sedum roseum* and *villosum*, *Oxyccocos quadripetala*, and *Arctostaphylos uva-ursi*.

December 7th.—EXHIBITS.—Mr. Hanson, a Golden-crested Wren, killed by flying against a window, and he drew attention to the different colouration of the crest in the sexes, the male having the centre deep orange, whilst in the female the whole crest is pale yellow. The Fire-crested Wren can be distinguished by its white eye-streak. Mr. Hall a specimen of the Trapdoor Spider (*Atypus affinis*), from near Beachy Head, last October. This specimen had been recorded from Hastings in 1856, and on Hampstead Heath and in Epping Forest.

COMMUNICATIONS.—Mr. Riches said that on October 20th, in cold weather, house Martins were seen on a house roof in Hornsey, and a young one was picked up in the street by a friend, who took it indoors and fed it. On the 25th it flew off.

OBITUARY.

COLIN MURRAY.

The Society lost one of its oldest members by the death of Colin Murray, which occurred on February 3rd, 1921, after an illness of only a few days' duration.

A member of a family deeply interested in Natural History, he had an intense love for many branches of that subject.

He was a keen and accurate observer and although of late years his visits to the meetings of the Society were very infrequent, he regularly contributed notes and records, chiefly ornithological, and many were of much interest.

He was of a very genial character, and held the esteem and affectionate regard of all who knew him.

BIRDS SEEN IN ANDALUSIA DURING SPRING, 1920.

By H. KIRKE SWANN, F.Z.S., M.B.O.U., etc.

(Read before the Ornithological Section of the L.N.H.S., on November 11th, 1920.)

Mr. Chairman, Ladies and Gentlemen,—I have been asked to come here this evening to give you some account of the birds I observed during my holiday in the Andalusian Sierras last spring. Unfortunately that holiday was cut short through domestic affairs, and I only had twenty days in Spain, of which seven were spent in travelling, so that my field work in the Sierras was actually restricted to thirteen days, of which the last four were chiefly remembered as “wet days”—and in the mountains, with the clouds hanging just overhead, “wet days” are very wet days indeed.

My companion, J. H. McNeile, and I, however, made the utmost use of these thirteen days, and I was successful in getting a few desired eggs; while my companion—who stayed in Spain two months—took a number of photographs and collected many more eggs, almost all of which, however, together with his note books, he lost through a railway thief on his return journey, so that I am unable to show any photographs this evening, except half a dozen of scenery.

We left London on March 24th, and travelled via Paris and Madrid, reaching Ronda, in the Serrania of that name, on March 28th. From there we went westward to Grazalema, a little town perched on the side of the mountain of San Cristobal, which we made our headquarters during the fortnight I remained in the Sierras. We saw little of note on the journey through Spain, except a pair of Great Bustards and two White Storks near Cordoba, together with many Hoopoes in the olive plantations south of that city. At Ronda we made our first acquaintance with the Spanish Vultures at the Hotel Reina Victoria, perched on the edge of a great cliff, where we saw fourteen great Griffon Vultures circling over the garden, while several Egyptian Vultures were to be seen lower down the cliff, and a single pair of Choughs.

At Grazalema we got rooms at the Fonda, recommended to me by Mr. Abel Chapman, and formerly kept by Juan Vasquez. We found, however, that Juan was dead and his son Francisco now carried it on. Francisco knew no English, while we knew little Spanish, but after these initial difficulties had been overcome with the help of the worthy notary who lodged at the Fonda, we were duly installed in nice clean rooms, and boarded at the table of the notary and the priest, who also lodged at the Fonda. To the notary, Don Antonio Garcia, as well as to our host Francisco Vasquez, we were indebted for the help and assistance so necessary to travellers in a strange country, especially when they know little of its language.

I went to Spain myself primarily to study the Raptorial birds so

common there, and to collect some of their eggs, but I think it better to give my observations on all the birds I met with, commencing with the birds of prey and dealing with the others in a somewhat condensed manner.

Of the three Spanish Vultures, we met with only two, the Griffon (*Gyps fulvus fulvus*) and the Egyptian (*Neophron percnopterus percnopterus*), the Black or Cinereous Vulture (*Agyps monachus*), being hardly ever found in these Sierras. It is in fact a tree-nesting species and breeds generally to the north of Andalusia. The mighty Griffon Vulture we saw hundreds of, and investigated two of the bigger Griffonries. This bird, always called *Buitre* by the Spaniards, is apparently never molested by them on account of its usefulness as a scavenger, so that its numbers increase rather than diminish. This, like other large birds of prey, is included in the term *pajaraca*, which is an understandable group to the ordinary Spaniard, and an Englishman is apparently less *loco*, or mad, if he wants to go after these than if he interests himself in the *pajarillos*, or small birds, as my companion did, and found to his cost that no Spaniard would own to knowing anything about them, nor could be induced to help him in looking for their nests. My acquaintance with the Griffon began, as I have said, at Ronda, but we had been at our mountain headquarters three days without seeing more than a casual Griffon until our host, Vasquez, took us, on March 31st, to a huge cliff, barely two miles away, where we found a great Griffonry with scores of nests, many containing eggs, although a number contained young ones, varying from a few days to as many weeks old. The Griffon, in fact, breeds right on from February to April. I climbed to my first Griffon's nest here, a nasty experience as the rock was very crumbly, but found the egg gone, although the *ranchero* who lived below the cliff, was sure he had seen it there a day or two before. This *ranchero* was a wonderful old fellow, probably over 70, judging by the family of descendants who filled his cabin, but he skipped about on the rocks like a goat in his heavy iron-shod boots, and he amused himself in taking the worthy Vasquez over the most slippery and dangerous paths, to his own huge enjoyment but certainly not to Vasquez's. He quickly found us another ledge higher up, to which my companion and I scrambled with him. As we reached the ledge he signed to us to duck, and as we did so out rushed two mighty Vultures sitting there, and swept over our heads and sailed away. From this ledge we each got a large white egg of the Griffon Vulture, one of which I am exhibiting to-night; both were much incubated. I got, however, one fresh egg (shown to-night) as late as April 7th—a very late date for fresh eggs—and it is remarkable for its extremely small size. The Griffon never lays more than one egg, but there may be two or more nests on one ledge, or rather apologies for nests, as the "nest" consists merely of a few odd sticks, bits of broom, esparto grass, etc. In one deep basin-like ledge, at the very top of the central turret of this range of cliffs, to which we sent up the *ranchero* on April 2nd, he found no less than five nests, one of which contained a fresh egg with some brown markings (which is also exhibited) while the

other four contained young in all stages of growth. From a hole in this same turret he took at the same time a pair of eggs of the *Bujo* or Eagle Owl. They were considerably incubated, as this was rather a late date. The nest contained the remains of a Redlegged Partridge and half a rabbit, both freshly killed. The note of the Griffon when sailing overhead is a loud croak, something similar to, but not so hoarse, as that of the Raven. Usually they are seen in small parties or singly, but on one occasion, on topping a mountain, we came on about fifty of these huge birds sitting round the remains of a feast, and the whole assembly on being disturbed took wing at once.

Of the small Egyptian Vulture we continued to see a few birds about each day, but there was no sign of a nest until April 6th, when I put a pair, which appeared to be nesting, out of a hole in a cliff on the west side of the mountain, but it was not until the 12th that I got their eggs, a fine pair of dark eggs, which I am showing to-night. The Egyptian Vulture is a very interesting bird at a little distance, and its snowy white plumage and black wing quills give it a very striking appearance. It is generally seen flying about much lower down than the Griffons which sail overhead, often at immense altitudes.

The bearded Vulture or Lammergeyer (*Gypaëtus barbatus grandis*), not a true Vulture at all, by the way, I did not actually see myself, although I was invited by a lad to go in quest of a bird "bigger than an eagle," which he said he had seen—an invitation, as we too often found, which was likely to be quite profitless. Chapman, however, saw it on this same mountain of San Cristobal some years previously, and my companion saw an example on more than one occasion after I left, so that it still remains in the district. I found, however, that the bird was unknown to all the other local Spaniards, and that its name, *Quebranta huesos*, was often given to the Egyptian Vulture, which was also sometimes called *Aguila blanca*. Our *ranchero*, however, applied this last name to a very different bird, Bonelli's Eagle (*Hieraëtus fasciatus fasciatus*), which was also sometimes called *Aguila real*, a name generally supposed to apply to the Spanish Imperial Eagle (*Aquila heliaca adalberti*), a bird we did not meet with in the Sierras. It is in fact a tree-building eagle. I made the acquaintance of Bonelli's Eagle on April 2nd by firing a pistol shot under the cliff to drive the Griffons from their nests. With them came from one side a magnificent gliding eagle, with white breast and white scapulars, which we recognised as Bonelli's, followed by a fine falcon, probably the Mediterranean Peregrine (*Falco peregrinus brookei*). The Eagle, turning back from us, met and stooped at the falcon, and they passed out of sight striking at one another. The *ranchero*, on being questioned, took us to a large old nest of sticks on a ledge in which he said the eagle bred the previous year, and would do this year. Not being satisfied, however, we went again the next day and put out the Eagle again by a shot, and I had the good fortune to see it come from a bush growing on the ledge of the cliff, behind which the nest, a huge mass of sticks nearly six feet across, could be made out. The help of the *ranchero* and an extra

man having been obtained, the former was let down by a rope into the nest, which contained one addled egg and a young bird a few days old, clothed in white down, together with a fresh Redlegged Partridge, partly eaten. The egg, a well-marked one, he brought up, and it is here to-night; but the young bird we ordered him to leave, nor would we permit the shooting of the old bird.

The Golden Eagle we saw a good many times around the mountain of San Cristobal, a great bare mountain 5,800 feet high, above the town we stayed in. For some days we could not locate a nesting site, but on the 5th we were told it was on the western side of the mountain, and went out and questioned the charcoal burners whom we found engaged in destroying Abel Chapman's *Pinsapo* Forest. They had seen the Eagles, always known as *Aguila negra*, or Black Eagle, and indicated a fearful mass of vertical pinnacles towards the west as the site. We could get no nearer that day, but on returning fell in with a local *ranchero* who knew the nest and thought there were eggs. The next day, therefore, I set out on horseback and spent two days in a fruitless errand, as the wet week had then set in and a cloud lay on the mountain top day by day.

The Booted Eagle (*Hieraëtus pennatus*) we did not meet with in these Sierras; it is in fact a tree-builder and is found on lower ground, and the same remarks apply to the Snake Eagle (*Circaëtus gallicus*).

The Common Kestrel (*Cerchneis tinnuncula tinnuncula*) we found in small numbers about the mountains, but the nests were difficult to reach. They were easier to get at when in trees, and McNeile took a set from an old nest of some other species in a tree near Seville. The Lesser Kestrel we first saw at Grazalema on the morning of April 4th, and they had apparently just then arrived. They were playing on the face of a cliff behind the town, but the next day they moved on to the big cliff below the town, where they apparently nested. In this same cliff was the great Choughery mentioned by Abel Chapman in "Unexplored Spain," but the nests were nearly all inaccessible. They were all the Redbilled Chough (*Pyrrhocorax pyrrhocorax*), locally called *Graja*. Here also was a large colony of House Martins (*Hirundo urbica*), the nests being placed against the face of the cliff, well out of reach. We saw here also several Black Wheatears (*Enanthe leucura leucura*), a very striking bird with jet black plumage and white tail. Its song is quite a sweet warble. McNeile was very anxious to discover the nest of this species, but we hunted in vain for it, although we found the bird common in several localities. He ultimately succeeded in finding four nests after I left, as well as nests of the allied species, *Enanthe hispanica hispanica*, known as the Blackeared Wheatear and Black-throated Wheatear, both these birds being now known as dimorphisms of the same species. We clearly identified on many occasions male examples with and without the black throat, and looking totally different birds to a casual observer. The common Wheatear we observed once, but it does not nest in Andalusia.

Another common bird about these Sierras was the Blue Rock Thrush (*Monticola cyaneus*), locally called *Solitario*, a handsome slaty-

blue bird with a silvery gloss on the head and neck. We found a nest of this species with three eggs in a crevice of a rock. It was as substantially built as a Blackbird's nest. The Common Rock Thrush (*M. savatilis*) was seen now and again but no nest was found. Stonechats were common, as also Mistle Thrushes, but Song Thrushes and Red-breasts were quite rare. Blackbirds were, however, common, but they belonged to a different form from the common British bird. The Black Redstart was also a common bird and was frequently seen, as also the Nightingale, which was first heard on April 8th. Among the other warblers observed was the Dartford Warbler, which was numerous in the furze on the mountains, although only one nest could be found; also the Subalpine Warbler and Sardinian Warbler, of both of which birds McNeile got nests later, together with the Orphean Warbler and the Tree Warbler (*Hypolais polyglotta*). The Goldcrest was only once seen, namely, on April 6th (I am tolerably certain that it was a Goldcrest and not a Firecrest), but the Tree Creeper was rather common, and we got a nest with three eggs out of a crevice in a tree. The Continental Great Tit was the commonest of the Titmice, and the Spanish Long-tailed Tit was only seen once, but the Wren was not uncommon. The Common Starling does not nest in Andalusia and we failed to find its ally, *Sturnus unicolor*, the Jackdaw being also absent, its place being taken by the Redbilled Chough. In fact the latter bird, which abounded, and a few pairs of Ravens, were practically the only members of the Crow family in the whole district. I once, however, saw a Common Magpie, and thought I once detected a Jay, but was not sure about it. Of the Shrikes the only one McNeile found nesting was the Woodchat Shrike, which seems abundant in the later spring.

The Common Swallow arrived at Grazalema on April 2nd, and awakened us by singing outside our windows. I noticed some slight difference of plumage between these and our British birds, the underparts particularly seeming much purer white. The Crag Martin (*Cotile rupestris*) we met with several times, but its nests were placed in the roofs of small caverns, and were quite inaccessible.

The principal Finches we met with were the Goldfinch, a different form, rather brighter in colour than our birds; the House Sparrow, common in the towns, the Spanish Sparrow being apparently not found near habitations; the Chaffinch, which we found to be very common and nesting in April; the Linnet, a southern form I believe, rather brighter in colour than the British form; and the Rock Sparrow (*Petronia stultia*), only occasionally seen. Of the Buntings the most conspicuous were the Corn Bunting, Ortolan Bunting, and Cirl Bunting, the latter replacing the Yellowhammer in Andalusia, and being very common, McNeile later on finding a number of its nests. We once or twice saw the Rock Bunting (*Emberiza cia*).

Of the Wagtails few were seen except the Grey Wagtail, a pair of which apparently had a nest on the stream right against the town of Grazalema. Of Larks there were the Crested Lark, of which two forms were identified by McNeile, and the large Calandra Lark. The

Swifts were common everywhere, and although we identified some as the Common Swift, it was impossible to say to what species all the Swifts seen belonged; at Grazalema, for instance, there were large numbers constantly flying high overhead in the evenings.

I only saw the Great Spotted Woodpecker in a wooded valley of the Sierres and did not meet with any other species. The Bee-eater I did not see until April 14th, when I observed many migrating north near Cordoba in small parties, while the Cuckoo was common from April 5th onwards.

Of course none but mountain birds were to be seen about Grazalema, so I have nothing to say about the waders, water birds, etc. On the return journey I saw Harriers near Ronda on a low-lying stream, and a pair of Common Buzzards, a bird not found in the higher mountains. Lesser Kestrels swarmed over the ruined Moorish towers towards Cordoba and over the Moorish Mosque at the latter place. Although the birds already occupied the holes in the roof of the Mosque, I was too early for eggs on April 15th, but the hotel guide kindly sent me on a set of eggs from one of these holes the following month, which I am now showing. About two miles from Cordoba I observed a Stork's nest on a straw stack at a farm, but saw little else of interest there, nor did I stay elsewhere in Spain on my return journey.

ARCHAEOLOGICAL SECTION. REPORT FOR 1920.

1. The Section now consists of 20 members.
2. Three meetings have been held during the year, and four inspections have been made.

The latter were as follow :—February 7th, Church of St. Ethelburga, Bishopsgate; May 15th, St. Mary's Church, Stone, Dartford, Kent; July 17th, Church of St. Nicholas, Worth, Sussex; and October 16th, Eastbury Manor, near Barking. Records of all these have been compiled and deposited in the Library during the year. A projected week-end, to visit Peterborough Cathedral, from October 15th to 18th, was abandoned with very great reluctance owing to the uncertain situation caused by the possible strike of miners. The Section had provided an Archaeological paper by Mr. Wattson for the general meeting on September 7th, but this also unfortunately had to be abandoned owing to difficulties with the lantern.

3. The new scheme of recording inaugurated at the end of last year has now been got into working order, though it is hoped that it will be improved and made more effective in the future. At present nine members are participating, but there is always room for more helpers, and all those who are willing to take their share are asked to communicate with Dr. Simpson without delay. The warmest thanks of the whole Section are due to Dr. Simpson for the energy and ability he has put into the work, resulting in compilations which it is hoped will be really valuable.

It is gratifying to know that the South-Eastern Union of Scientific Societies have applied for particulars of our recording scheme, with a view to inaugurating an Archaeological Section of the Union.

4. Mr. Chapman, to whom the warm thanks of the Section are also due for much devoted work in the Secretarial department during most difficult times, was obliged to resign the Secretaryship at Midsummer. His place has been taken by Mr. Tremayne. Mr. Stowell has also been appointed joint recorder with Dr. Simpson.

5. The Committee have also to express their deep indebtedness to Mr. P. J. Hanson for his handsome gift of a camera for the photographic purposes of the Section. This has supplied a long-felt want, and the Committee feel extremely grateful for his kindness.

E. B. BISHOP, *Chairman.*

LAWRENCE J. TREMAYNE, *Hon. Secretary.*
October 28th, 1920.

ARCHAEOLOGICAL INSPECTIONS, 1920.

St. Ethelburga, Bishopsgate.—Visited February 7th, 1920.

This, the smallest mediæval church in the City, was chosen as a

simple example for the first entry under the new recording scheme. Nothing was found that had not already been noted by archaeologists. The main architectural feature is the nave arcade of the XVth century. The half arch at the west end of this arcade excited some discussion.

St. Mary the Virgin, Stone, Kent.—Visited May 15th, 1920.

A resumé of the known history of this fine XIIIth century church was collected from various sources. Its architectural history called for some discussion, and it was thought that evidence existed to show that the responds of the piers of the tower were later than the arches above. This was explained by an encasing of the original piers in the XIVth century. The close similarity of the work here and at Westminster Abbey was noted, and the various alterations in the chancel at the restoration by Street were deprecated. The Brasses and Monuments were enumerated and described. Photographs were obtained and an interesting record added to the library.

St. Nicholas, Worth, Sussex.—Visited July 17th, 1920.

This interesting church gave rise to much discussion. In its ground plan and walling it dates from the Saxon Era, and much fine workmanship of this period is still present in the church. An exceptional, if not unique, feature is found in the twin-light Saxon windows lighting the nave. Some suggestions were put forward by Mr. Bishop to interpret the difference in feeling between the work of the arches of the chancel and transepts and that of the doors in the north and south walls of the aisles. He suggested that here is evidence for two periods of building in Saxon times. There is much to support this explanation, set out in the Record, and as far as is known it has not been put forward before. Other features of interest, such as its history, woodwork, and heraldic monuments, are also dealt with in the Record. In an appendix, arising out of Mr. Bishop's suggestion, lists of many Saxon Churches are given, with the dimensions of their various parts and height of walls where known, and an original attempt is made to tabulate these in order of their height-to-width ratios. Several, including those at Bradford and Deerhurst, are discussed in the Appendix.

Eastbury Manor House, Barking, Essex.—Visited October 16th, 1920.

This neglected architectural gem dates from the time of Elizabeth, and proved highly interesting. The history of the building was brought up to date in our Record, and new facts not mentioned in the work of the London Survey Committee were included. The building itself is of brick with very few Renaissance details. Much discussion centered round the five-flued chimney stack on the south side, and it was suggested that a hidden chamber existed in this part of the building. In support of this view Mr. Stowell prepared careful plans and elevations of the stack, but no explorations were made. The mural paintings were described.

BOTANICAL SECTION. REPORT FOR 1920.

Whilst some able new members have been added to the Section

during the past year, there is still an unfortunate tendency to leave most of the work in the hands of a few.

Two evenings for the whole Society have been arranged, wholly or partially, by the Section, and two Sectional meetings have been held, that on 21st September having been occupied by an interesting Exhibition and Discussion on "British Violets," introduced by Mr. R. W. Robbins.

The week-end at Whitsuntide was spent at Saffron Walden, Essex, with headquarters at the "Rose and Crown" Hotel. The most noteworthy plants found were *Melampyrum cristatum*, *Primula elatior* (in abundance), *Paris quadrifolia*, and a doubtful *Erysimum*, not yet identified. Ten members and friends were present during the whole or part of the visit, and an enjoyable time was spent. The leader on one of the outings was our old friend and member, Rev. P. H. Cooke, who kindly entertained the party at tea at his Rectory, at Ickleton, about 4 miles from Saffron Walden.

Some useful lists of plants found in the Society's district, both north and south, have been sent to the Recorder during the year. Special thanks in this connection are due to Rev. P. H. Cooke, Mr. W. Watson and Mr. Tremayne.

During the year 6 new species have been added to the records of the Northern portion, the only one worthy of mention being *Coronilla varia*, L. Ninety-one new species have been added to the records for Southern portion, the most noteworthy being:—

Helleborus viridis, L. var.,
 occidentalis (Reuter).

Fumaria parviflora, Lam.

Viola calcaria, Gregory.

Stellaria neglecta, Weihe,
 var. *umbrosa* (Opiz).

Geranium rotundifolium, L.

Trifolium squamosum, L.

Trifolium glomeratum, L.

Lotus tenuis, Waldst. & Kit.

Lotus angustissimus, L.

Epilobium lanceolatum, Seb.
 & Maur.

Epilobium roseum, Schreb.

Bupleurum tenuissimum, L.

Galium anglicum, Huds.

Valeriana officinalis, L.

Centaurea Calcitrapa, L.

Lactuca Serriola, L.

Lactuca saligna, L.

Pyrola minor, L.

Samolus Valerandi, L.

Centaureum pulchellum, Druce.

Cuscuta europaea, L. (On *Urtica*
 dioica, L.).

Calamintha nepeta, Savi.

Chenopodium Vulvaria, L.

Polygonum mite, Schrank.

Myrica Gale, L.

Habenaria rivescens, Druce.

Polygonatum multiflorum, All.

Alopecurus aqualis, Sobol.

Glyceria fluitans, Br. \times *plicata*,
 Fr. (= *pedicellata*, Towns.).

Glyceria declinata, Bréb.

Hordeum marinum, Huds.

It may be of interest to set out the following summarised statement of records of plants found by members in the Society's district. Such statement includes a few hybrids and well-marked varieties, and of course a fair number of casuals.

NORTHERN PORTION OF DISTRICT.

Total Species, etc., 806.

1. Colnbrook 348	7. Enfield Chase 436
2. Rickmansworth 381	8. Lea Valley 322
3. Hounslow 347	9. Epping 506
4. Harrow 483	10. Hainault 270
5. Mimms 360	11. Brentwood 321
6. Hampstead 375	12. Rainham 335

114 species are recorded as occurring in all of the sub-districts.

SOUTHERN PORTION OF DISTRICT.

Total Species, etc., 807.

1. Weybridge 350	7. Holmesdale 372
2. Wimbledon 211	8. Blackheath 490
3. Chessington 256	9. Kent Marshes 132
4. Norwood 157	10. Darenth... .. 307
5. Banstead 381	11. North Downs 259
6. Caterham 170	12. Westerham 86

Four species only have been recorded as occurring in all of the sub-districts, viz.:—*Sambucus nigra*, *Galium aparine*, *Tussilago farfara*, and *Urtica dioica*.

In any comparison of the above figures it must be borne in mind that in the Northern portion they represent quite 15 years of work, whilst in the Southern portion they represent only 6 years. It would appear obvious that, whilst the Northern portion has been much more thoroughly worked, the Southern has the richer Flora.

Special attention is drawn to the need for increased efforts in Sub-district 10 of the Northern portion and in 4, 6, 9, and 12 of the Southern, but lists from all parts of the area, including even the most common species, stating the sub-district and date of observation, with specimens (other than those of common species) whenever possible, will be welcomed gladly by the Recorder. If lists can be arranged in order of London Catalogue (tenth edition) the Recorder will be greatly obliged and his work will be much simplified. The Recorder for 1921 will be Mr. E. B. Bishop, Lindfield, Marshall Road, Godalming.

R. W. ROBBINS, *Chairman*.

(Mrs.) C. L. WILDE, *Secretary*.

LEPIDOPTERA SECTION—REPORT for 1920.

Nine meetings of the Section have been held during the year under review. It has been decided to arrange a definite syllabus for the meetings, to include the provision of a paper at each meeting, in place of the "exhibition and discussion" which has been the practice hitherto. It is too early to form any conclusion as to the results of this change, but there are indications that it will be beneficial in stimulating interest in our work.

No notable addition has been made to the local list during the year but the occurrence of *Agronota nemoralis* at Brentwood in 1907, recorded by Mr. G. H. Heath, has been noted.

The Society's library has been enriched by the addition of six M.S. volumes, the work of our member the late Mr. A. U. Battley, embodying his collecting experiences over 25 years. These volumes contain much information as to the local lepidopterous fauna and will be a notable contribution to our records.

A successful field meeting was held at Chingford on May 29th, as a result of which series of *Nola cucullatella* ab. *fuliginalis* were bred by several members.

Steps have been approved to render the Society's collections of Lepidoptera more useful and to bring them up to date, and subject to the confirmation of the scheme by the Council, it is hoped to make substantial progress with the re-arrangement during the coming year.

E. A. COCKAYNE, *Chairman*.

HAROLD B. WILLIAMS, *Hon. Sec.*

REPORT OF THE ORNITHOLOGICAL SECTION FOR 1920.

1. The Annual Meeting of the Section was held on November 16th, when the following officials were elected to form the Committee for 1921:—Mr. W. E. Glegg, Chairman; Mr. S. Austin, Secretary; Mr. A. Brown, Recorder; together with Messrs. J. E. S. Dallas and P. J. Hanson. Mr. W. E. Glegg was elected to represent the Section on the Transactions Committee.

2. The Membership of the Section has progressed satisfactorily during the year, 7 new Members of the Society having joined the Ornithologists, *viz.*:—Miss G. M. Towsey, Mrs. G. E. Thomas, and Messrs. J. E. S. Dallas, H. J. Davis, P. W. Horn and R. T. Cross.

3. The Section provided the following papers for the Syllabus which were read before Ordinary Meetings of the Society, *viz.*:—On January 6th, "Macedonian Birds," Part I., by Mr. W. E. Glegg; March 2nd, "London Birds," by A. Holte Macpherson, F.Z.S.; October 5th, "Macedonian Birds," Part II., by Mr. W. E. Glegg. Three Sectional Meetings were held at which papers, etc. were read as follows:—January 20th, "Ornithological Notes in 1919," by Messrs. W. E. Glegg and P. W. Horn; April 20th, "The Nicholson Egg Collection"—Exhibition and Description by Mr. S. Austin; November 16th, "Notes on the Birds of the Andalusian Sierras," by H. Kirke Swann, F.Z.S., M.B.O.U. A paper was read at the Chingford Branch on October 11th by Miss Hibbert-Ware, F.L.S., on "Birds of the Woodland and Waterside."

4. The Committee decided to try the experiment of providing for regular monthly Field Meetings throughout the year, and the programme arranged and carried through was as follows:—

January 25th. Roding Valley. Leader, Mr. S. Austin.

February 22nd. Dagenham. „ Mr. P. W. Horn.

March 28th.	Staines.	Leader Mr. W. E. Glegg.
April 25th.	Stort Valley.	„ Mr. R. J. Hanson.
May 16th.	Woldingham.	„ Mr. J. E. S. Dallas.
June 5th.	Richmond Park.	„ Miss G. M. Towsey.
July 25th.	Puttenham	„ Mr. L. J. Tremayne.
August 29th.	Pitsea	„ Mr. W. E. Glegg.
September 26th.	Hainault Forest.	„ Mr. A. Capleton.
October 24th.	West Thurrock.	„ Mr. P. W. Horn.
November 28th.	Cuffley.	„ Mr. S. Austin.
December 27th.	Canvey Island.	„ Mr. A. Brown.

The experiment has met with success, every Meeting having been sufficiently well attended for interesting and valuable observational field work to be done. It is proposed to continue this feature of the Section's programme during the coming year.

In addition to the above the Committee of the Section held 4 meetings during the year.

5. The paper read by Mr. H. Kirke Swann, F.Z.S., M.B.O.U., on the "Birds of the Andalusian Sierras" has been selected by our Committee for recommendation to the Transaction Committee for publication. Reference should be made to the important paper on Macedonian Birds read by Mr. W. E. Glegg, and it is hoped that some arrangement will ultimately be made for its preservation in permanent form.

6. The Fifth Annual Report on the Birds of Epping Forest is printed elsewhere. Records from certain sections of the Forest area are conspicuous by their absence, and Members and friends are asked to assist your Committee in making this Report more complete.

7. Forty-three birds have been ringed during the year under the "British Birds" Marking Scheme. No recoveries have been reported.

8. The collection of photographs of birds and nests has been further increased, the number now being 108, covering 75 species.

9. Two species new to the Society's district have been recorded, making the total number 159. These new occurrences are:—*Anas strepera* (Gadwall), two on the lake, Navestock Park, Essex, November 7th, 1920, recorded by Mr. W. E. Glegg (see "British Birds," vol. xiv., p. 188); and *Nyroca marila* (Scaup), ♀, West Thurrock Marsh, Essex, October, 1905 (skin in Stepney Borough Museum), recorded by Mr. P. W. Horn (see "Essex Naturalist," vol. xix., p. 264).

10. Other interesting records are as follow:—*Pica pica* (Maggie), April 5th, 1920, between Wood Hatch and Roding, and August 8th, 1920, Nazeingwood Common, both reported by Mr. W. E. Glegg; November 12th, 1920, two in Gilwell Lane, Epping Forest, and December, 1920, seen constantly between Gilwell Lane and the Jubilee Retreat, Epping Forest, both reported by Miss Hibbert-Ware (per S.A.); November 14th, 1920, two near Hatch End, Pinner, reported by Mr. L. J. Tremayne; and October 3rd, 1920, Chelsham, Surrey (also seen and heard there during spring), reported by Mr. J. E. S. Dallas. *Fringilla montifringilla* (Brambling), February 22nd, 1920, Dagenham, flock of 30, reported

by Mr. P. W. Horn (Field Meeting); November 7th, 1920, High Beach, Epping Forest, reported by Mr. S. Austin; January, 1919, Chelsham, Surrey, large numbers feeding on beech mast; February 9th, 1919, Richmond, feeding on beech mast, both reported by Mr. J. E. S. Dallas. *Lanius excubitor* (Great Grey Shrike), January 11th, 1920, Warren Plain, Epping Forest, reported by Mr. W. E. Glegg; March 20th and April 2nd, 1920, Fairmead Bottom, E.F.; April 14th, 1920, near Strawberry Hill Pond, E.F.; reported by Mr. P. D. Hayward (per S.A.) (see "British Birds," vol. xiv., p. 21); April 5th, 1920, Ham Common (recorded in "Field," April 17th, 1920, and "British Birds," vol. xiv., p. 21), and May 15th, 26th and June 13th, Ham Common, reported by Miss Towsey (see "British Birds," vol. xiv., p. 45). *Savicola rubicola* (Stonechat), June 5th, 1920, pair, Ham Common, reported by Miss Towsey (Field Meeting). *Enanthe oenanthe* (Wheatear), April 10th, 1920, ♀, Magpie Hill, Epping Forest, reported by Mr. W. E. Glegg; June 20th, 1920, Edgware, with young, reported by Mr. J. E. S. Dallas. *Dryobates minor* (Lesser Spotted Woodpecker), May 10th, 1920, with young (early date), Sidcup, Kent, reported by Captain D. H. Meares (per S.A.). *Asio accipitrinus* (Short-eared Owl), October 24th, 1920, West Thurrock Marsh, Essex, reported by Mr. P. W. Horn (Field Meeting) (see "Essex Naturalist," vol. xix., p. 266). *Carine noctua* (Little Owl), July 12th, 1920, Crew's Hill, near Enfield, reported by Mr. P. J. Hanson. *Buteo buteo* (Bazard), pair seen circling at considerable height, Barnet, Herts, reported by Mr. H. Kirke Swann (per S.A.) (see "British Birds," vol. xiv., p. 136). *Falco peregrinus* (Peregrine Falcon), April 5th, 1919, Barnet, reported by Mr. H. Kirke Swann (per S.A.) (see "British Birds," vol. xiii., p. 31). *Scelopax rusticola* (Woodcock), October 18th, 1920, flushed by Keeper Bynoth at back of "Robin Hood," Epping Forest, reported by Mr. P. D. Hayward (per S.A.). *Totanus ochropus* (Green Sandpiper), September 18th, 1920, five flushed from Romford Canal, Dagenham; December 5th, 1920, Fairmead Bottom, Epping Forest, both reported by Mr. W. E. Glegg (see "Essex Naturalist," vol. xix., p. 261). *Crex crex* (Corncrake), May 15th, 1920, Chigwell Lane, near Loughton, reported by Mr. P. D. Hayward (per S.A.). *Podiceps cristatus* (Great Crested Grebe), mid-April, 1919, pair nested on lake, North Kent; June 2nd, four young birds seen (see "British Birds," vol. xiii., p. 59; again nested in same locality, 1920 (see "British Birds," vol. xiv., p. 94), both reported by Captain D. H. Meares (per S.A.).

11. The thanks of the Section are due to those members of the Society who have assisted it in its work, and also to the following friends, to whom it is indebted for many interesting records and notes, viz.:—Miss A. Hibbert-Ware, and Messrs. T. M. Blagg, P. D. Hayward, H. C. Playne, H. Kirke Swann, H. Boyd Watt, and Capt. D. H. Meares.

W. E. GLEGG, *Chairman*.
S. AUSTIN, *Secretary*.

EXTRACTS FROM MINUTES OF THE ORNITHOLOGICAL SECTION FOR 1920.

January 20th.—EXHIBITS.—Mr. L. J. Tremayne exhibited the tail feathers of a Woodcock, the white spots at the tips being very striking. Mr. P. J. Hanson exhibited the skin of a Curlew.

COMMUNICATIONS.—Mr. W. E. Glegg reported having seen a Grey Wagtail at the Walthamstow Reservoirs on January 17th. Mr. C. S. Bayne spoke of the movements of Gulls on the Thames in London, and stated that they departed at dusk from their day haunts, some parties going east, others west. During a recent holiday spent on the Cornish coast he had observed Oyster-catchers eating worms which they appear to wash first. Upon a Peregrine Falcon flying over a flock of birds of mixed species feeding on the mud flats, it was noticed that the Black-headed Gulls were the first to show alarm and fly off.

PAPERS.—“Field Notes on Ornithology in 1919.” Mr. P. W. Horn read some notes on ornithological observations made at West Thurrock, Essex. He showed a sketch map of the district and gave a short description of its features together with details of the species observed. Mr. W. E. Glegg followed with a short paper on “Birds observed during May and June at Lymington and the Isle of Wight,” the most interesting species being the Dartford Warbler—seen at Ventnor.

January 24th.—Visit to inspect Mr. H. Kirke Swann's collections at New Barnet. By invitation a small party spent a most enjoyable evening examining a very fine series of skins of the *Accipitres* at Mr. Kirke Swann's house and also his collection of eggs of the same order, both of which were displayed and explained by our host.

January 25th.—FIELD MEETING.—Roding Valley. 16 species identified, including Kingfisher and Barn Owl.

February 22nd.—FIELD MEETING.—Dagenham, Essex. 34 species identified, including Brambling and Red Legged Partridge.

March 28th.—FIELD MEETING.—Staines. 34 species identified, including Kingfisher and Tree Sparrow.

April 20th.—COMMUNICATIONS.—Messrs. Bayne, Glegg, Hanson, Hayward, Robbins, and Ross gave dates of the first records of the spring migrants observed in various districts. Mr. H. C. Playne wrote to say that he had observed a Great Grey Shrike at Loughton on April 7th and 12th. Mr. W. E. Glegg observed that this would probably be the same bird seen by him in the same locality on December 25th last.

PAPER.—Mr. S. Austin read some notes on the Nicholson Egg Collection, which had been arranged for exhibition on tables in the meeting-room. He gave some account of the history of the collection stating that it had been formed by the Rev. George Nicholson, father of our late member, Mr. Charles Smith Nicholson, F.L.S., F.Z.S., by

whom the collection had been bequeathed by will to the Society. The collection consisted of 1670 eggs contained in 3 cabinets and comprised all the species on the British List, as mentioned by Howard Saunders in his Manual. Its chief scientific value was in the exceptionally fine series of eggs of the Guillemot and Razorbill, the result of many years' collecting and selection, and covering an extremely wide range of variation.

April 25th.—FIELD MEETING.—Stort Valley. 40 species identified including Wheatear and Redshank.

May 16th.—FIELD MEETING.—Warlingham, Surrey. 43 species identified including Wryneck and Nightjar.

June 5th.—FIELD MEETING.—Petersham and Richmond. 47 species identified including Stonechat and Wryneck.

July 25th.—FIELD MEETING.—Puttenham Common, Surrey. 31 species identified including the Shoveller.

August 29th.—FIELD MEETING.—Pitsea, Essex. 40 species identified including Magpie and Green Sandpiper.

September 26th.—FIELD MEETING.—Hairault Forest. 23 species identified; nothing specially noteworthy.

October 24th.—FIELD MEETING.—West Thurrock, Essex. 29 species identified including Short-Eared Owl and Little Owl.

November 16th.—EXHIBITS.—Mr. P. J. Hanson exhibited a skin of the Brambling from Winchmore Hill and a Kestrel purchased in Leadenhall Market. Mr. P. W. Horn, a skin of the Scaup, procured at West Thurrock.

COMMUNICATIONS.—Mr. H. Kirke Swann reported a Buzzard at Barnet and stated that he had received reports of the Peregrine upon three occasions in the same district during the last two years. He remarked that both species would be passing on migration. Mr. R. W. Robbins referred to the large congregations of the Starling in the grounds of Guy's Hospital which he estimated to be about 1,200 birds. Mr. W. E. Glegg reported Gadwall on the lake at Navestock, Essex, also on the 7th inst. Mr. Colin Murray wrote from Ilford to record a flock of between 60 and 70 Black-headed Gulls soaring in the air and feeding on winged ants. Captain D. H. Meares sent a communication respecting the early breeding of the Lesser Spotted Woodpecker at Sideup, Kent, young being found in the nest on May 10th. A letter was read from Mr. P. D. Hayward who reported the Corn Crake calling at Chigwell Lane on May 15th.

PAPER.—Mr. H. Kirke Swann, F.Z.S., M.B.O.U., read a paper on

"Notes on the Birds of the Andalusian Sierras," which is printed in this volume on pages 14 to 19.

November 28th.—FIELD MEETING.—Cuffley, Herts. 30 species, including Lesser Spotted Woodpecker and Little Owl.

December 27th.—FIELD MEETING.—Canvey Island, Essex. 23 species identified, including Rock Pipit, Curlew, Dunlin and Ringed Plover.

REPORT OF THE PLANT GALL SECTION, 1920.

This Section has been able to show increased activity during the past year with the result that further species of galls have been added to the British list, and several interesting observations have been made in the Society's district and elsewhere.

One paper—on Willow Galls—has been read before the full society and two papers have been read to the section, *viz.*, on June 15th "Recent work by Messrs. Bagnall and Harrison on Oak Galls," and on December 21st "Galls on Leguminosæ."

The Members took part in the Botanical Section's Whitsuntide expedition to Saffron Walden, and have also carried out excursions to Esher, Cuffley, Betchworth, Staines, and Bookham.

The following list has been compiled from the material collected during the year, and contains those species that seem to be of most interest.

On *Viola cornuta*; *Eriophyes violae*, Nal. Mr. Bristow's garden at Cobham.

On *Silene latifolia*, Rendle and Britten; *Hyalopterus melanocephalus*, Buckton. Near Fulmer, and at Beaconsfield Station.

On *Lychnis dioica*, Linn.; *Contarinia steini*, Karsch. Near Fulmer.

On *Euonymus europæus*, Linn.; *Contarinia convolvens*, Nal. From Kingston Vale, Box Hill, and near Uxbridge, and Leatherhead.

On *Acer campestre*, Linn.; (i.) Dr. Hr. Houard's No. 4027 "Diploside," found near Leatherhead and near High Ashurst, 5th June, plentifully, some of the galls containing the larva, which drops out on being disturbed. Old galls were found later on at Box Hill, Headley, near Uxbridge, Albury, Horsley, Harefield and Herringgate. It is probably common, but has hitherto been overlooked owing to developing early in the year. (ii.) *Atrichosema aceris*, Kieff. Was noted from Headley, Uxbridge, West Hyde and Ruislip. (iii.) *Perrisia acerisrapsans*, var. *rubella*, Kieff, from West Hyde.

On *Ulex minor*, Roth.; *Apion scutellare*, Kirby. Sunningdale to Virginia Water Station.

On *Vicia tetrasperma*, Mœnch.; *Perrisia viciae*, Kieff. Near Uxbridge.

On *Vicia sativa*, Linn.; Old swelling on the stem with an empty gall possibly due to *Apion Gyllenhali*, Kirby. Near Bedford.

On *Lathyrus pratensis*, Linn. (i.) *Perrisia lathyricola*, Rübs., near

Uxbridge. (ii.) Leaflets forming tight rolls containing whitish larvæ of a midge. *Perrisia* sp. (possibly Dr. Houard's 3776.) Near Uxbridge.

On *Lathyrus montanus*, Bernh.; (i.) *Perrisia* sp. Leaves loosely rolled containing yellow midge larvæ. Near Hedgerley. (ii.) *Macrolabis orobi*, F. Low. Near Virginia Water Station.

On *Spiraea Ulmaria*, Linn.; *Perrisia pustulans*, Rübs. Near Uxbridge.

On *Spiraea Filipendulæ*, Linn.; *Perrisia ulmariae*, Bremi. Leatherhead Down.

On *Poterium Sanguisorba*, Linn.; *Mecinus pyraister*, Herbst. Found by Dr. E. A. Cockayne at Alton Barnes, Hants. This beetle seems to have been only recorded previously as attacking the stems of *Plantago*.

On *Epilobium angustifolium*, Linn. (i.) *Perrisia Kiefferiana*, Rübs., was recorded from Cuffley, Sunningdale, Virginia Water district, West Hyde, Harefield and Herringsgate. (ii.) *P. epilobii*, F. Löw. Cuffley (L. B. Hall), Virginia Water district, Harefield, and Herringsgate.

On *Enothera biennis*, Linn. Leaves transversely puckered, midrib stunted. Chessington. Due to an aphid.

On *Bryonia dioica*, Jacq.; *Perrisia bryoniae*, Bouché. Hanwell and Fulmer.

On *Viburnum Lantana*, Linn.; *Oligotrophus Solmsii*, Kieff. Very plentiful on Box Hill, July 10th.

On *Galium verum*, Linn.; *Eriophyes galii*, Karp. Leatherhead.

On *G. mollugo*, Linn. (i.) *Eriophyes galii*, Karp. Near Headley, near Horsley, and at Ruislip. (ii.) *Perrisia galii*, H. Löw. Fulmer and Harefield. (iii.) *Schizomyia galiorum*, Kieff. Farnham Royal and Harefield. (iv.) Cecidomyid. (Houard, No. 7372). Well established in one place near Harefield.

On *G. saxatile*, Linn. (i.) *Eriophyes galii*, Karp. Richmond Park, Kingston Vale, Wimbledon Common and Sunningdale. (ii.) *Phyllocoptes anthobius*, Nal. Wimbledon Common.

On *G. palustre*, Linn.; *Perrisia hygrophila*, Mik. Uxbridge, Sunningdale (Thorpe) Surrey, Farnham Royal, Fulmer, Bookham, Runemede and Windsor Forest.

On *G. uliginosum*, Linn.; (i.) *Perrisia galii*, H. Löw. Kingston Vale, and Wimbledon Common. (ii.) *Eriophyes galii*, Karp. Bookham.

On *G. aparine*, Linn.; (i.) The upper parts of the shoots forming white tufts due to the heads being densely covered with short hooked white hairs. Apparently due to *Eriophyes* sp. but no mites were detected under the microscope. *E. galii* was plentiful elsewhere in the lane on the same species of plant, but these white-headed plants had no rolled leaves, so the galling must be caused by some other species. A large patch of the plant was galled. Near Bedfont, May. When visited in October all the galled shoots had withered, though there was plenty of fresh growth showing rolled leaf galls due to *E. galii* in the vicinity. (ii.) *E. galii*, Karp., frequent in most places. This mite was very prevalent this last year on the various species of *Galium*.

On *Valerianella dentata*, Poll.; *Trioza centranthi*, Vail. Sussex. (E. B. Bishop.)

On *Scabiosa columbaria*, Linn.; *Eriophyes squalidus*, Nal. Albury.

On *Gnaphalium uliginosum*, Linn.; *Pemphigus filaginis*, Fourc. Very abundant near Uxbridge, and also found near Denham.

On *Achillea millefolium*, Linn.; Flower head elongated; agent not discovered. Near Brentford.

On *A. Ptarmica*, Linn.; *Rhopalomyia ptarmicae*, Vallot. A strong colony in a lane near Farnham Royal, and also near Uxbridge.

On *Senecio vulgaris*, Linn.; *Tephritis marginata*, Meigen. Near Weybridge (L. B. Hall), Gerrard's Cross station, Brentford, and Thorpe (Surrey).

On *Serratula tinctoria*, Linn.; Flower heads twisted, deformed and slightly swollen. White Cecidomyid larvæ found in some, and orange Cecidomyid pupæ in others. Sunningdale and Horsley.

On *Centaurea scabiosa*, Linn.; *Loewiola centaureae*, F. Löw. Headley.

On *Hieracium pilosella*, Linn.; *Tylenchus* sp. Box Hill, St. Anne's Hill, and plentiful near Hedgerley.

On *H. umbellatum*, Linn.; *Carpotricha pupillata*, Fallen. Several galled heads near Virginia Water station.

On *Sonchus arvensis*, Linn.; *Cystiphora sonchi*, F. Löw. Beaconsfield station, and Herringsgate.

On *Campanula rotundifolia*, Linn.; *Miarus campanulae*, Linn. Clandon Downs.

On *Primula veris*, Linn.; Calyx divided into many sharp points, and densely covered with short light brown hairs. Flowers aborted. Looks like the work of *Eriophyes*, but it was impossible to make a microscopical examination at the time. Three flowers found on one root near Thaxted, Essex. L. B. Hall, May 23rd.

On *Veronica officinalis*, Linn.; *Perrisia veronicae*, Vallot. Burnham Beeches.

On *Thymus serpyllum*, Linn.; *Janetiella thymicola*, Kieff. Teesdale, E. B. Bishop.

On *Lamium album*, Linn.; *Macrolabis corrugans*, F. Löw, Perivale and elsewhere. The insect was also noted on other plants and is probably common.

On *Ulmus glabra*, Huds.; *Tetraneura ulmi*, De Geér, was frequent round Saffron Walden in May.

On *U. campestris*, Linn.; *Eriophyes* sp. (probably Houard 2044). Thick white felting of short hairs on the undersides of the leaves containing mites. Bookham.

On *Quercus pedunculata*, Ehrh.; The most abundant oak gall round London seems to have been *Andricus globuli*, Hartig.

On *Quercus cerris*, Linn.; (i.) *Andricus circularis*, Mayr., was found at Bedford, Leatherhead, St. Anne's Hill, Richmond Park, Wimbledon Common, Putney Heath, and near Sunningdale. It was plentiful in most of these localities, thus showing that it had been abundant in the spring, though apparently unrecorded recently. (ii.) *Callirhytis*

glandium, Giraud, near Horsley and south of Windsor Great Park.
(iii.) *Cynips kollari*, Hartig. Near Leatherhead, 3 galls.

On *Q. ilex*, Linn.; *Eriophyes ilicis*, Can. Near Leatherhead and Box Hill.

On *Salix fragilis*, Linn.; The gall attributed to *Eriophyes triradiatus*, Nall., is still spreading rapidly and has been noted on both sides of the river Colne below Uxbridge; near Teddington Lock on the Surrey side of the Thames; and on Ham Common. Down the river it is very plentiful at Tilbury Dock. On the canal from Brentford it has spread up to Hanwell.

On *S. purpurea*, Linn.; (i.) *Rhabdophaga nervorum*, Kieff. Barnes Common. (ii.) *Cryptocampus testaceipes*, Yadd. Barnes Common.

On *Populus nigra*, Linn.; *Pemphigus spirothecae*, Pass. These galls were well developed on June 6th, and as a year ago an opinion was hazarded that the agent might be *P. protospirae*, Lich., specimens were sent to Mr. F. V. Theobald, who very kindly determined the Aphis to be the former species. The galls persist for a long time on the tree and may be sometimes seen still in position the following year. On the continent this species of gall is said to appear only in the autumn, while *P. protospirae* produces a similar gall in May and June.

HAROLD J. BURKILL.

January, 1921.

CHINGFORD BRANCH—REPORT FOR 1920.

The Chingford Branch has had a satisfactory year. There have been one or two losses through members leaving the district, but against this there has been a considerable increase in Branch Associates and members, and the same improvement has been evident in the attendances at the meetings, the lowest being 16, on a very inclement evening, and the highest 45, the average being close upon 32.5 as against 25 in 1919.

Papers or lectures were given as follows:—"Trees of Epping Forest," by R. W. Robbins; "Nature Notes near Howe," by Hugh Main, B.Sc.; "The Making of England" (Geological), by Rev. H. Dewhurst, M.A.; "Birds of the Woodland and Waterside," by Miss Hibbert-Ware, F.L.S.; "Hints on Aquarium keeping," by P. W. Horn; "The Buried Palace of Knossos," by Rev. J. H. Gamble, M.A., and in addition two evenings devoted to Microscopes and one evening to Epping Forest with notes by Messrs. Ross, Nicholson and the Hon. Secretary. This last was so well appreciated that there will be another next session. The local branch members are greatly indebted to the parent society for the support they have always given them especially in the matter of finding lecturers.

COUNCIL'S REPORT FOR 1920.

(PRESENTED AT THE ANNUAL MEETING, 7TH DECEMBER.)

A considered view of the work of the Society during the year which is now closing gives no cause for disquietude. Although it cannot be said that our affairs have boomed during the year, yet there are hopeful signs that we have turned what fairly may be termed a dangerous corner.

During the year we have added to our roll twenty-six names, representing thirteen members and thirteen associates. This is encouraging, but members are urged to endeavour to make the Society and its work so much better known that we may be able to report a still greater increase in our members' list next year.

Twenty-one field meetings have been held under the ægis of the Society, and these appear to have been very successful. One section gained three new adherents solely on account of the field meetings.

Of the difficulties that have incidentally presented themselves, the greatest, no doubt, is the one of finance.

It was foreshadowed in the report of last year that some alteration in the subscription would be necessary. The Council has decided now to recommend the Society so to alter the rules that the following changes would be effected:—(1) The minimum subscription will be seven shillings and sixpence; (2) Members elected after June 30th will pay five shillings for the year of their election; (3) Each member will receive one copy only of the "Transactions." These changes will bring a little more money, and effect some economy in expenditure.

The "Transactions" form one of the most important features of our work, but, unfortunately, owing to the change in money values, the size of the annual volume has been much reduced. These "Transactions" are paid for by voluntary subscription, and the Council appeals earnestly to members to increase their donations so that that this all-important department may not suffer.

Among the brighter sides of our affairs stands out the splendid work being done at Chingford. The Branch is in a thriving condition, which is in a large measure due to the energy and enthusiasm of the local Secretary, Mr. E. Samuelson. This Report would not be complete without a tribute to his work.

At the present, efforts are being made to revive the Woodford Branch. Advice or assistance which will lead to this desirable end will be welcomed. A revival of the Woodford meetings would widen the scope of the Society's activities.

The Council expresses its warm appreciation of the action of Mr. W. E. Glegg in taking up the duties of Secretary under difficult conditions, at a time when he had not long returned from active service, and was not assured of continued good health.

Natural History must take its part in the work of reconstruction which is proceeding silently throughout the world. The ebb of the world's affairs has changed to a flow, and as we make use of the favourable tide in like measure may we hope to realise our ambitions.

THE LONDON NATURAL HISTORY SOCIETY.

TREASURER'S ACCOUNTS FOR THE YEAR 1920.

GENERAL ACCOUNT:

	£	s.	d.
By 1919 Balance	7	16	4
" 1920 Donation	0	13	6
" Subscriptions in arrears	8	7	6
" Subscriptions in advance	4	0	0
" Subscriptions and Entrance Fees	39	8	0
" Interest on Deposit	0	4	5
" Interest on Exchequer Bonds	0	9	0
" Library Sales	3	12	11
" Cash in hand	0	15	0½
To Postages and Stationery (Secretary's)			
" Postages (Treasurer's)			
" Lepidoptera Section expenses			
" Ornithological Section Expenses, 1918 1919			
" Subscriptions			
" Gratuity			
" Printing			
" Rent			
" Binding			
" Insurance			
" Removal			
" Chingford Branch expenses			
" Sundry expenses			
" Balance in hand			
	£65	6	8½

REPORT ON THE BIRDS OF EPPING FOREST FOR THE YEAR 1920.

The presentation of this report completes the first quinquennial period, which seems to be a suitable moment to view retrospectively the data that have been accumulated. A consideration of the five reports shows that much progress has been made and that the Section is well justified in persevering with this part of its work; moreover, it should not be forgotten that this period may be said to have been under the shadow of the war.

During the five years 92 species have been identified, all strictly within the Forest area. The most notable among these are the Great Grey Shrike, Hooded Crow, Green Sandpiper (in December), Common Sandpiper, Wheatear, Grey Wagtail, Yellow Wagtail, Jack Snipe, Magpie, Siskin, Brambling, Woodcock, Whinchat, Stonechat and Wryneck. The mention of the last-named to those not acquainted with the area may seem remarkable, but the Wryneck may be said to be entirely absent from the Forest.

Evidence suggests that the winter visitors have decreased, and probably this has a direct relation to the mild nature of recent winters. Our experiences show that the statement which has been made elsewhere, that during winter Song Thrushes almost completely disappear and that the numbers of Blackbirds are augmented in a very marked manner, is substantially correct. It is probable that the Siskin is an annual visitor to the Alders in Highams Park, and it would appear to be an established fact that the Reed Bunting immigrates annually to the tracts of *Molinia varia*.

With respect to that important feature, the Wanstead Heronry, the number of nests has steadily decreased from 72 in 1916 to 58 in 1920. This may not give cause for alarm, but it must be carefully watched. Although it has been done annually, it is felt that the Report would not be complete without an urgent appeal being made to all those interested in the bird-life of Epping Forest for records, which should be sent to the Secretary, Mr. S. Austin, 43, Darent Road, Stamford Hill, N. 16.

CARRION CROW (*Corvus corone*).—The status of this species is still maintained. Several nests were located between Chingford and High Beach.

JACKDAW (*Corvus monedula*).—Recorded throughout the year from Chingford Plain, Fairmead Bottom, Hatch Plain, High Beach, Ludgate Plain, Strawberry Hill, Warren Hill, Whitehall Plain and Yardley Hill. During winter months seen in company with starlings and rooks. A party of sixteen seen in the birches by High Beach Church, March 20th. On June 13th, seen in company with rooks on the trees by Ludgate Plain, apparently feeding on larvae.

ROOK (*Corvus frugilegus*).—Observed on Chingford Plain, Hatch

Plain, High Beach, Ludgate and Whitehall Plains, frequently with starlings and jackdaws. Seen feeding, apparently on larvæ, on the trees by Ludgate Plain, June 13th. Mr. McKenzie, Forest Superintendent, reports (20-10-20):—"It was rather extraordinary, this year, that although last winter we had more rooks than ever in Wanstead Park, yet in the spring there were remarkably few nests and hardly any in amongst the herons; they may have found some other place for nesting where they would not be so worried as with us."

MAGPIE (*Pica pica*).—Two in Gilwell Lane, November 12th (Miss A. H. W.). Two seen constantly throughout December between Gilwell Lane and the Jubilee Retreat (Miss A. H. W.).

BRITISH JAY (*Garrulus glandarius rufitergum*).—The status of this species is well maintained. Observed freely throughout the forest during the year. An adult and six young birds seen on Warren Plain, June 27th.

STARLING (*Sturnus vulgaris*).—Recorded, except during autumn, from the more open spaces of the forest. Seen, in company with rooks and jackdaws, on Chingford Plain, April 11th. Nests annually in Hill Wood. Frequently breeds in holes in trees that woodpeckers have made, one so observed near Ludgate Plain during June, and another in Hill Wood in the same month.

GREENFINCH (*Chloris chloris*).—Numerous records in autumn and winter. During winter seen feeding on hips and hornbeam seeds. Heard in full song, Highams Park, December 26th.

HAWFINCH (*Coccothraustes coccothraustes*).—Observed frequently, except during nesting season. Recorded from Wanstead, sometimes as many as twenty or thirty together. (Miss G. L.)

BRITISH GOLDFINCH (*Carduelis carduelis britannica*).—Several seen by the Red Path, November 14th; one, with redpolls, feeding on the seeds of silver birch, Turpin's Hollow, November 21st; Highams Park, December 25th and 26th; Whitehall Plain, December 26th.

SISKIN (*Spinus spinus*).—One identified in a flock of redpolls, feeding on alder seeds, Highams Park, December 26th.

HOUSE SPARROW (*Passer domesticus*).—Observed in parts of forest near to houses.

TREE SPARROW (*Passer montanus*).—Chingford Wood, April 10th and 17th; Whitehall Plain, April 24th and October 19th.

CHAFFINCH (*Fringilla coelebs*).—Numerous records throughout the year. More than one heard in full song, Chingford Plain, February 18th; also heard in full song, Highams Park, December 25th.

BRAMBLING (*Fringilla montifringilla*).—One identified near High Beach Church, November 7th.

LINNET (*Acanthis cannabina*).—Two seen and song heard, Yardley Hill, April 18th; another, at the same place, July 18th.

LESSER REDPOLL (*Acanthis linaria cabaret*).—Flock of about forty, Turpin's Hollow, November 20th; flock of about twenty, feeding on seeds of silver birch, same place, November 21st; flock, Highams Park, December 25th and 26th.

BRITISH BULLFINCH (*Pyrrhula pyrrhula pileata*).—Numerous records

throughout year, except May, from most parts of Forest. In July the "piping" of the bird seemed much louder than that heard earlier in the year. Two partly fledged birds seen on Old Church Plain, August 22nd.

YELLOW HAMMER (*Emberiza citrinella*).—Recorded during the first seven months of the year at Almshouse Plain, Chingford Plain Fairmead Bottom, Gilwell Lane, Warren Plain, and Wormleyton Pits. Abundance of song during June and July.

REED BUNTING (*Emberiza schenckii*).—Fairmead Bottom, March 27th, April 11th (in song), and December 26th.

SKYLARK (*Alauda arvensis*).—Recorded throughout the year on open spaces such as Chingford Plain, Fairmead Bottom and Warren Plain; also Highams Park. Song first heard, Chingford Plain, February 1st.

PIED WAGTAIL (*Motacilla lugubris*).—One, in company with a yellow wagtail, Chingford Plain, April 11th; also seen Chingford and Hatch Plains, December 19th.

GREY WAGTAIL (*Motacilla boarula*).—One seen on Staple's Hill, where the pond used to be, October 8th.

YELLOW WAGTAIL (*Motacilla flava*).—Chingford Plain, April 11th.

TREE PIPIT (*Anthus trivialis*).—This species was well represented this year, though not so abundant as last. First date, April 6th. Fairmead Bottom.

MEADOW PIPIT (*Anthus pratensis*).—One, Hatch Plain, February 27th. This bird seems much scarcer than formerly, probably owing to the recent mild winters.

BRITISH TREE CREEPER (*Certhia familiaris britannica*).—Well distributed; recorded throughout the year.

NUTHATCH (*Sitta caesia*).—Frequent records from High Beach, Hill Wood, and Old Church Plain, and one from Great Monk Wood. During May and June, a pair of birds were watched at nest, Hill Wood; a fragment of egg-shell was found under this nest, June 27th. Two birds, one evidently young, were seen at another nesting site, Hill Wood, June 12th.

GOLDCREST (*Regulus regulus*).—Numerous records. This species seems not only to be restored to its former numbers but is probably more common than before the severe winter of 1917.

BRITISH GREAT TITMOUSE (*Parus major newtoni*).—Freely recorded. Spring note first heard, Hill Wood, February 2nd.

BRITISH COAL-TITMOUSE (*Parus ater britannicus*).—Numerous records. Party of young, Loughton Hole, July 10th.

BRITISH MARSH-TITMOUSE (*Parus palustris dresseri*).—This species has also been well observed. Family seen, Chingford Wood, June 27th.

BRITISH BLUE TITMOUSE (*Parus caeruleus obscurus*).—Constantly recorded throughout year. Observed on alders, feeding on the seeds, Highams Park, December 9th; seen eating soft parts of haws, Highams Park, December 26th.

BRITISH LONG-TAILED TITMOUSE (*Aegithalus caudatus roseus*).—Also well observed throughout year. Seen carrying nesting material,

Chingford Wood, March 13th; nest found completed outside, fragments of paper being included, March 27th. Another nest found, Pear Tree Plain, April 17th.

GREAT GREY SHRIKE (*Lanius excubitor*).—This species, probably the same bird as was observed in December, 1919, has again been recorded. On January 11th, it was seen by Mr. Glegg, on Warren Plain, as before. The bird rose from the ground and settled on highest part of tree, where the observer had a good view of it. On leaving the perch it was swept away by the gale that was blowing. (Recorded in "British Birds," vol. xiii., p. 247.) Mr. P. D. Hayward also had good views of it on Fairmead Bottom, March 20th and April 2nd, and again near Strawberry Hill Pond, April 17th. (Recorded in "British Birds," vol. xiv., p. 21.) Mr. H. C. Playne also had good views of a very fine male, about Fairmead, April 7th and 12th.

RED-BACKED SHRIKE (*Lanius collurio*).—Fairmead, May 10th; Old Church Plain, May 22nd, ♂ June 13th, and ♂ July 14th; ♂ and ♀, Warren Hill, July 4th; same pair seen, nest and one young bird found, July 11th; second pair, Strawberry Hill, July 11th; another pair, with two young, Fairmead, July 11th.

WHITETHROAT (*Sylvia communis*).—First identified, Fairmead and Chingford Wood, April 17th. Nest, with 5 eggs, Woodford, May 19th.

LESSER WHITETHROAT (*Sylvia curruca*).—First observed in thickets near Strawberry Hill Pond, May 1st.

GARDEN WARBLER (*Sylvia simplex*).—Three heard, High Beach, May 3rd; seen in thickets near Strawberry Hill Pond, May 5th.

BLACKCAP (*Sylvia atricapilla*).—First date, Chingford Wood, April 10th; song heard, Bury Wood, April 18th.

REED WARBLER (*Acrocephalus streperus*).—Mr. H. C. Playne reports, June 2nd, "In the late afternoon I spent an hour sitting close to a reed-warbler, which was singing in a thick bush between Connaught Water and the High Road."

WILLOW WARBLER (*Phylloscopus trochilus*).—First noted in thickets near Strawberry Hill, March 30th.

WOOD WARBLER (*Phylloscopus sibilatrix*).—First identified in birch woods, High Beach Church, April 29th; nest with three eggs, High Beach, June 6th; bird sat on nest for three weeks, finally deserting it.

CHIFFCHAFF (*Phylloscopus collybita*).—First date, Highams Park, March 27th.

MISSLE THRUSH (*Turdus viscivorus*).—High Beach, January 4th and August 1st; pair, Red Path, February 1st; Fairmead, February 18th and April 18th; alarm note heard, Old Church Plain, March 14th; singing, Hill Wood, March 14th and 21st; Highams Park, April 10th, December 5th, 19th and 25th; singing, Warren Hill, May 15th; two in the willows, Chingford Plain, December 12th. Nest, near Theydon Bois, April 8th.

BRITISH SONG THRUSH (*Turdus musicus clarkii*).—Observed throughout year, but its comparative absence during winter was noticeable.

Singing well, Warren Plain, February 15th. Two nests with eggs, Yardley Hill, April 18th.

REDWING (*Turdus iliacus*).—The only record in the early part of the year of the previous season's migrants of this species was on February 29th, when three birds were seen on Warren Hill; but during the latter part of the year, from October onwards, the birds were very common and their abundance was the feature of bird life in the forest at that time. At Fairmead, on November 14th, one, or possibly two, heard singing well for some time, and again on November 20th.

FIELDFARE (*Turdus pilaris*).—The same remarks apply to this species as to the preceding. The records for the first part of the year are scanty; but the migrants during the latter part were very numerous. Flock of twelve making a great noise, Whitehall Plain, December 19th.

BLACKBIRD (*Turdus merula*).—Well observed throughout the year. Nest, with two eggs, High Beach, April 17th. Another, very exposed, containing four eggs, Cuckoo Pits, May 12th. Song heard April 11th.

REDSTART (*Phoenicurus phoenicurus*).—Well recorded. First seen, Ludgate Plain and Highams Park, April 10th. Song heard, April 18th.

BRITISH REDBREAST (*Erithacus rubecula melophilus*).—Numerously recorded throughout year. Song first heard, Chingford Plain, February 1st.

COMMON NIGHTINGALE (*Luscinia megarhynchos*).—Recorded from Almshouse Plain, Chingford Plain and Wood, Connaught Water, Fairmead, Grimston's Oak, High Beach, Hill Wood, Long Hills, Ludgate Plain, Mount Pleasant, Old Church Plain, Strawberry Hill Pond, Warren and Whitehall Plains, and Yardley Hill. First identified, Strawberry Hill, April 10th. Adult and two young seen, Chingford Wood, June 27th.

WHEATEAR (*Enanthe enanthe*).—♀, Magpie Hill, April 10th.

HEDGE SPARROW (*Accentor modularis*).—Not so well recorded as last year. Fairmead Bottom, January 11th; singing well, Debben Slade, March 21st; High Beach, June 6th; Long Hills, September 19th; Magpie Hill and Fairmead Bottom, December 26th.

WREN (*Troglodytes troglodytes*).—Well recorded from all parts of forest. First heard singing, near "Robin Hood," February 1st; family seen, parent birds very noisy, Theydon, July 10th.

SPOTTED FLYCATCHER (*Muscicapa grisola*).—High Beach, May 15th; "Wake Arms," June 13th; family seen, Hill Wood, August 22nd.

SWALLOW (*Hirundo rustica*).—Paul's Nursery, Nursery Road and bottom of Staple's Hill, April 13th; High Beach, May 3rd; Warren Hill, May 15th; Chingford Plain, May 22nd; Warren Plain, June 27th; Hawksmouth and Yardley Hill, July 18th; Fairmead Bottom, August 1st; Lower Forest, September 19th.

MARTIN (*Delichon urbica*).—Forest Road, Loughton, May 9th; High Beach, May 15th; Highams Park, June 27th; Warren Hill (few seen), July 11th; Yardley Hill, July 18th; Chingford Plain,

August 15th; High Beach (two seen), August 22nd; High Beach, Honey Lane Quarters and Bell Common, September 19th.

BRITISH GREAT SPOTTED WOODPECKER (*Dryobates major anglicus*).—Numerously recorded throughout year. Five nests, between Chingford Wood and Hill Wood, were under observation during the season, four being in beech trees and one in a crab tree, all containing one or more young. The nestlings were first heard "chanting" on June 6th, and, on the same day, while the female bird was feeding young at one of the nests, a starling (having a nest near by in a beech tree) was observed to dart into the nesting hole over the head of the adult bird and remained there for some time. On June 12th one of the young birds was found dead at the foot of this tree. Other nests were observed at Jack's Hill, May 22nd, in a decayed birch, the mass of chips being very remarkable. In Monk Wood, June 18th, two adults and two young were flying about, calling loudly and incessantly.

LESSER SPOTTED WOODPECKER (*Dryobates minor*).—Seen and heard several times, High Beach, February 1st; Hill Wood, February 2nd, 15th, March 21st, April 17th and June 6th; heard once and seen several times in oaks, probably same bird, also observed "moving backwards," Bury Wood, March 7th; call heard and bird watched "drumming," Fairmead Pond, May 9th; Highams Park, April 10th, December 19th and 16th.

GREEN WOODPECKER (*Picus viridis*).—Hill Wood, February 2nd, March 20th (calling persistently), April 17th and May 8th; Fairmead Bottom, February 1st, 7th (♀ flushed, bird sat so exposed that sex could be determined by moustachial streak), March 7th (calling), April 10th, June 6th and December 30th; Old Church Plain, June 6th, August 15th, November 14th (seen and heard); Warren Plain, August 1st; Strawberry Hill, February 1st, April 11th, December 21st; Blackbush Plain, August 15th; High Beach, February 1st, May 3rd; Broad Strood, July 10th; Red Path, February 28th; Whitehall Plain, December 26th.

Cuckoo (*Cuculus canorus*).—Recorded from Bury Wood, Chingford Plain, Fairmead, High Beech, Hill Wood, Long Hills, Warren Hill and Plain, and Yardley Hill. First heard, Yardley Hill, April 18th; High Beach, ♂ and ♀ heard, May 3rd.

SWIFT (*Micropus apus*).—Fairmead, April 29th, Warren Hill, May 15th; Chingford Plain, June 6th; Yardley Hill, July 18th.

NIGHTJAR (*Caprimulgus europaeus*).—Clay Ride, May 12th; Jack's Hill, May 15th, ♂ and ♀, and May 22nd. One roosted in field belonging to Bancroft's School, Woodford, for several days at the end of August and on September 1st (H. C. Playne).

KINGFISHER (*Alceda ispida*).—Mr. H. C. Playne reported that in May the birds returned to the Ching at Woodford for a few days, but went off again without nesting there; Connaught Water, December 5th.

TAWNY OWL (*Strix aluco*).—Chingford Wood, calling at 7 p.m., March 20th; St. Thomas's Quarters, calling at 1 p.m., September 19th.

SPARROW HAWK (*Accipiter nisus*).—Grimston's Oak, April 11th; Yardley Hill, July 18th (two).

KESTREL (*Falco tinnunculus*).—Highams Park, March 27th; Warren Plain, May 15th; Fairmead, December 30th.

MALLARD (*Anas boschas*).—Well recorded throughout year (except during July and August). Observed at Barn Hoppit Pond, Chingford Plain, Connaught Water, Fairmead Bottom, Strawberry Hill Pond, and Whitehall Plain. Greatest number seen at one time was 30 on Connaught Water, February 15th. Observed in pairs, Connaught Water, March 14th. Seven young seen on Barn Hoppit Pond, May 15th.

POCHARD (*Nyroca ferina*).—Connaught Water, January 18th, 25th, February 16th, 18th, 28th (two), December 5th (♂), 11th (nine); Highams Park, three ♂, January 11th.

HERON (*Ardea cinerea*).—Warren Plain (flying over), April 11th; Fairmead (two flying over), April 18th. Mr. McKenzie reports (20-10-20):—"This spring the keeper counted 58 herons' nests on the Lincoln Island, Wanstead Park, and I should think quite an average number of birds were hatched off."

WOODCOCK (*Scolopax rusticola*).—One bird flushed by Keeper Bynoth at back of "Robin Hood," October 18th.

GREEN SANDPIPER (*Totanus ochropus*).—One seen by Mr. Glegg by side of pond on Fairmead Bottom, December 5th. The bird was easily identified, being seen at short range, the white of the tail and the rump being very conspicuous. On noticing the observer it rose in the air with a snipe-like flight, uttering its loud whistling call. It disappeared in the direction of Long Hills.

LAPWING (*Vanellus vanellus*).—Chingford Plain, flying high February 15th; Warren Plain, flying over, March 21st.

BLACK-HEADED GULL (*Larus ridibundus*).—Highams Park, December 19th.

LITTLE GREBE (*Podiceps fluitilis*).—Snaresbrook, two or three on pond, October 16th.

MOORHEN (*Gallinula chloropus*).—Strawberry Hill Pond, April 11th, November 21st (two); Whitehall Plain, April 10th, December 5th; Highams Park, December 5th, 19th (twelve), and 25th; Connaught Water, December 5th; Barn Hoppit Pond, February 7th (seven), May 15th (2 adults and 3 young), June 26th (young), June 27th (several), October 30th (over a dozen).

TURTLE DOVE (*Streptopelia turtur*).—Connaught Water, May 26th, heard June 27th.

RING DOVE (*Columba palumbus*).—Chingford Wood, twelve, December 19th; Fairmead, April 20th, August 22nd, December 30th; Fairmead Bottom, April 10th; Grimston's Oak, April 11th; High Beach, May 3rd, August 15th; Jack's Hill, May 8th; Wormleyton Pits, ten, November 11th.

PHEASANT (*Phasianus colchicus*).—Pear Tree Plain, ♂, March 18th; Hill Wood, flushed, July 4th.

PARTRIDGE (*Perdix perdix*).—Yardley Hill (four), April 18th.

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